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Graduate, Undergraduate, *and* Non-Academic Courses

1963-1964



GRADUATE SCHOOL

**UNITED STATES DEPARTMENT
OF AGRICULTURE**

EDUCATION FOR FEDERAL EMPLOYEES

U. S. DEPT. OF AGRICULTURE
SEP 29 1964
CURRENT CATALOG

Calendar for 1963—1964

FALL SEMESTER

Sept. 7-14	Registration (Late fee charged after Sept. 14)
Sept. 16-20	Classes begin
Sept. 27	Last day of registration for credit
	Last day of course transfer without late fee
Oct. 11	Deferred payments due
Oct. 25	Deadline for credit—audit change
Nov. 11	Veterans Day—no classes
Nov. 28	Thanksgiving Day—no classes
Dec. 24-Jan. 1	Christmas holidays—no classes
Jan. 2	Classes resume
Jan. 17	Close of fall semester *

SPRING SEMESTER

Jan. 25-Feb. 1	Registration (Late fee charged after Feb. 1)
Feb. 3-7	Classes begin
Feb. 14	Last day of registration for credit
	Last day of course transfer without late fee
Feb. 24	Holiday for George Washington's Birthday
Feb. 28	Deferred payments due
Mar. 13	Deadline for credit—audit change
May 22	Close of spring semester *

SUMMER SESSION

May 23-May 29	Registration (Late fee charged after May 29)
June 1-5	Classes begin
June 5	Last day of registration for credit
	Last day of course transfer without late fee
June 12	Deferred payments due
June 19	Deadline for credit—audit change
July 3	Holiday for Independence Day—no classes
August 7	Close of summer session *

* Class meetings that are missed for any reason will be made up. Classes are not held on days when Government offices are closed early or all day due to hazardous weather conditions.

CATALOG

of the GRADUATE SCHOOL *of the*
UNITED STATES DEPARTMENT OF
AGRICULTURE



FALL—SPRING—SUMMER

1963-64

*Please keep this catalog for use in the
Spring and Summer*

This Catalog, published annually by the Graduate School, contains the graduate and undergraduate programs for the fall and spring semesters and the summer session. The right is reserved to make changes in the course offerings as circumstances require. Bulletins on correspondence study and special programs are available upon request.

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UNITED STATES DEPARTMENT OF AGRICULTURE

ORVILLE L. FREEMAN, *Secretary of Agriculture*

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General Information

PURPOSE OF THE SCHOOL

The objective of the Graduate School of the United States Department of Agriculture has always been to improve the Federal Service by providing needed educational opportunities for Federal employees. The Graduate School has six main programs: resident evening, special, correspondence, international, public lectures, and the press. Graduate study is a primary interest of the School, but it also offers a large number of undergraduate as well as non-credit courses. All courses are open to qualified employees of the Federal Government and to other qualified persons as facilities permit.

FOUNDING OF THE SCHOOL

The statute that established the Department of Agriculture in 1862 gave it the responsibility to "disseminate agricultural information in the broadest sense of the word." From the beginning, employees of the Department were educators. It soon became apparent that they needed opportunity to continue their education while working.

The Secretary of Agriculture expressed in 1898 the need of the Department for an organization such as the Graduate School. There was special need for continuing education for young scientists doing research in the Department. No action was taken at that time. However, shortly after the First World War, when the demand for qualified personnel became acute throughout the Federal Government, the Congressional Joint Committee on the Reclassification of Salaries recommended that the departments of the Government give more attention to the development of opportunities within the Federal Service for the continuing education of their employees. Accordingly, the Secretary of Agriculture appointed in 1920 a special committee to explore the matter. After consideration of the findings of the committee and after consultation with leading educational institutions and other government departments and agencies, the Secretary established the Graduate School in 1921. He said at that time: "I believe those who may be able to avail themselves of this opportunity will both enrich themselves and enhance the value of the service they render."

ACCREDITED STANDING

The Graduate School does not grant degrees and has never sought that authority. It prefers to give courses of standard graduate and undergraduate quality, to assure that quality through the competence of its instructors, and to cooperate with the degree-granting institutions. A student should consult *in advance* of registration with the college or university from which he wishes to receive academic credit for courses taken in the Graduate School.

The United States Civil Service Commission accepts the credits of the Graduate School, for examination and qualification purposes, on the same basis as those from accredited colleges and universities.

ADMINISTRATION

The government of the Graduate School is vested in a General Administration Board appointed by the Secretary of Agriculture. The functions of this Board are similar to those of a board of trustees of a college or university. The School is administered by a director and a small administrative staff. It is nonprofit and receives no Federal funds.

The resident evening program in Washington is organized into eight departments. Each department is directed by a departmental committee composed of a chairman and members of recognized competence in a particular field. The committees organize and give general administrative direction to the curricula of the departments. Some departments are divided into smaller academic areas and are directed by subcommittees subject to the approval of the departmental committee. There is also a Special Program Committee to advise on offerings designed for particular needs of departments and agencies of the Federal Government. The eight departmental chairmen, together with the chairmen of the Special Program and Correspondence Committees make up the Council of the Graduate School. The Director serves as chairman. Similar committees direct other activities.

TEACHING

The faculty of the Graduate School is recruited mainly from scholars employed in the Federal Service. Most faculty members have taught in the colleges and universities in the United States and abroad before joining the Federal Government. They want to maintain academic contacts and like to teach. Thus they are attracted to the Graduate School. Because their positions in the Federal Government relate closely to the subjects they teach in the evening, they bring a fresh academic point of view and a practical approach to the classroom.

LIBRARY RESOURCES

The student body of the Graduate School has access to the noted library facilities in the capitol of the United States. There is a large library in the Department of Agriculture, containing more than one million volumes on agriculture and other subjects. Supplementing the Department Library is a collection of books supplied by the Graduate School. In addition, students can draw upon the rich storehouses of the Library of Congress, the Smithsonian Institution, the National Archives, and other exceptional special libraries.

CERTIFIED STATEMENTS OF ACCOMPLISHMENT

A certified statement of accomplishment is offered in accounting, administrative procedures, editorial practices, library techniques, management, meteorology, natural history field studies, oceanography, public administration, statistics, and surveying and mapping. A student interested in working toward a certified statement of accomplishment in any of these fields should plan his proposed course of study with the Registrar. The requirements for each statement are listed under the appropriate Department in this volume.

The certified statement of accomplishment is offered to encourage the student to complete a well-rounded program in his chosen field of study. Each student who receives a certified statement is also given a transcript of his record. This is useful as public evidence of qualification. At the request of the student, an official transcript is sent to the institution or agency designated by him.

Regulations and Procedures

ADMISSION

All qualified employees of the Federal Government and other qualified persons are eligible to be admitted to resident and correspondence courses in the Graduate School.

ENTRANCE REQUIREMENTS

The Graduate School does not offer degree programs. Consequently the requirements for entrance depend upon the level of the course for which the student is registering.

Undergraduate courses are open to graduates of a standard high school or to persons who have demonstrated that they have achieved an equivalent educational level. For admission to more advanced courses, college work in the same or related field is presumed. Specific prerequisites are stated for admission to many courses. A student is expected to have completed the first semester of a year course before he may register for the second semester.

FEDERAL TRAINING LEGISLATION

Under the authority of the Government Employees Training Act (Public Law 85-507), Federal departments and agencies have authority to pay for training of employees in non-Government facilities when training is necessary and not reasonably available within Government. By training is meant "the provision of opportunities to acquire skill or knowledge related to the work of the respective Federal agencies." The Graduate School is a non-Federal facility, and, through contractual arrangements, the tuition fees and related expenses of a Federal employee can be paid by his agency. The student should make these arrangements with his supervisor or personnel office in *advance* of registration.

VETERANS

Graduate School resident evening courses are available to veterans under the provisions of Public Laws 550 and 634. Registration for part-time study is charged against educational benefits only in the proportion that the number of semester hours bears to a full normal load.

A veteran who is re-entering the Graduate School classes after an interruption of training, or who is entering the Graduate School for the first time, is advised to consult the Registrar in *advance* of registration so that approval of a program can be obtained from the Veterans Administration.

SCHOLARSHIPS

The Graduate School offers scholarships each semester, in the form of free tuition for one course, to the principal participants in the interdepartmental management intern program operated by the United States Civil Service Commission. There is also available a limited number of course scholarships for qualified Federal and District Government employees. Application for these scholarships should be made before May 15 to the personnel offices of the Federal departments and agencies. The recipients are selected by the Scholarship Committee of the Graduate School from the nominations made by the agencies.

COUNSELING SERVICES

Officers of the Graduate School are available throughout the registration periods and from 9:00 a.m. to 5:00 p.m. each weekday for counseling on educational plans in the Graduate School, or elsewhere. An educational and vocational testing and counseling service is available upon the payment of a fee. Appointments for this service are made in advance.

TRANSFER OF ACADEMIC CREDIT

A student cannot assume that academic credit for work done at the Graduate School will be accepted by any particular college or university. Such credit is generally granted on the basis of the individual courses taken, the over-all program of the student, and the quality of the work done by the student.

A student who wishes to take an advanced degree should consult in *advance* the dean of the graduate school of the university in which he wants to become a candidate for a degree. He should obtain approval in *advance* for any courses in the Graduate School that he wants to use toward his degree. The student who is deficient in basic undergraduate courses required before undertaking graduate work can find many such courses in the large undergraduate program of the Graduate School. Others are available in the local colleges and universities.

A student who is interested in working toward an undergraduate degree should similarly consult in *advance* the dean of the institution from which he hopes to receive the degree if he wishes credit for work taken at the Graduate School.

REGISTRATION

The registration period for each semester is shown on the calendar on the inside front cover. A late fee for each course is charged for registration after the opening of the semester. After the second week of classes in the fall and spring semesters, and after the first week in the summer session, a student may register for credit only with the approval of the instructor and the Registrar. Registration is not completed until the required fees have been paid.

COURSE LOAD

A student who is employed full time may carry more than two courses only with the permission of the Registrar.

FEES

Course Fees. The tuition charge is in general \$14.00 for each semester hour credit.

Late Fees. A fee of \$2.00 for each course is charged for late registration. A fee of \$1.00 for each course is charged for late transfer.

Reinstatement Fees. A fee of \$2.00 for each course is charged for reinstatement to the student who fails to meet payments when due, in addition to all accrued fees.

Laboratory Fees. Laboratory or materials fees are listed in the *Schedule of Classes* for each semester, in connection with the courses for which they are charged.

Service Fee. A fee of \$1.00 for each course is charged the student using the deferred payment plan.

Transcript Fee. A fee of \$1.00 is charged for each copy of a student record on the regular Graduate School form or on the form of another institution or state board of education.

These are current fees and are subject to change.

Fees are due and payable in advance at the time of registration. Registration is not completed, and no student is permitted to attend classes until all fees have been paid.

An arrangement can be made at the time of registration for payment of fees in two installments, one half and a service fee at the time of registration, and the balance by the end of the fourth week in the fall and spring semesters, and by the end of the second week in the summer session. After the first two weeks of classes, fees must be paid in full at the time of registration.

A student who fails to meet payments when due will be suspended and may not attend classes until he has been reinstated and has paid all accrued fees as well as a reinstatement charge of \$2.00 for each course.

All fees are payable at the Business Office, Room 1031, South Building, U. S. Department of Agriculture, Washington 25, D. C.

FEDERAL INCOME TAX DEDUCTIONS

In accordance with an Internal Revenue Service regulation of April 5, 1958, expenses for education are deductible if they are undertaken for the purpose of "maintaining or improving skills by the taxpayer in his employment." This regulation is in many instances applicable to courses taken in the Graduate School.

ATTENDANCE AT CLASSES

Students are expected to attend all meetings of classes and not to be absent without adequate reason.

Absence does not relieve the student from responsibility for work required while he was absent, and the burden of proof that the work has been done rests with the student. In courses in which the work cannot be satisfactorily tested by written examination, the instructor shall be the judge of the relation of the student's attendance or nonattendance to his grade. A student registered for credit who is absent more than 25 per cent of the class periods receives a mark of "W," withdrawn, unless he makes up all required work. Auditors who are absent more than 25 per cent of the class periods receive the mark of "W."

CREDIT AND GRADES

Academic Credit. The student registering for academic credit must satisfy all prerequisites for admission to the course as generally stated, or as specified in the course description.

Audit. An auditor must meet the same prerequisites as a credit student. He receives full privileges of class participation if he chooses to exercise them. An auditor does not receive a grade. He receives the mark "AUD."

Change from Audit to Credit. A student may change his registration from audit to credit, or vice versa, within 30 days after the beginning of the semester in the fall and spring, and within two weeks after the beginning of the summer session. The request for change must be made in writing to the Graduate School. Special forms are available at the Business Office.

Grades. At the close of the semester, the student receives written notice by mail of the grades he has received. The following letter grades are used:

A	Excellent	F	Failure
B	Good	Aud	Auditor
C	Fair	Inc	Incomplete
D	Passable	W	Withdrawn

TRANSCRIPT OF RECORD

Inclusion in Personnel Record for Department of Agriculture Employees. To aid in effecting its promotion-from-within policy, the Department has provided (USDA Administrative Regulations, Title 8, Chapter 42, paragraphs 1548-1551, dated 10-13-48) that a record of Graduate School credits earned by its employees is to be placed in official personnel files of the agency. Unless specifically requested by the employee that such action not be taken, the Graduate School forwards, upon completion of the courses or at the end of the year, a copy of the student's record, without cost to the employee, to the personnel officer of the unit of the Department of Agriculture in which the student is employed.

Transcripts for Employees of Other Agencies. The student who is not an employee of the Department of Agriculture can obtain an information record or transcript for his personnel file or for other purposes by requesting such a record in writing from the Graduate School. There is a charge of \$1.00 for each information record or transcript.

WITHDRAWAL AND REFUNDS

Application for withdrawal from Graduate School classes must be made in writing to the Registrar. A form for this purpose is available in the Business Office. *To report the dropping of a course to an instructor does not constitute official withdrawal.* Permission to withdraw is not given to a student who does not have a clear financial record.

Refund of tuition fees *only* can be granted in cases of official withdrawal according to the following schedule:

<i>Fall and Spring Semesters</i>	<i>Refund</i>
During the first and second weeks of the semester	Tuition less \$5.00 registration fee for each course. (A minimum of \$5.00 for each course will not be refunded.)
During the third and fourth weeks of the semester	60 per cent of the total tuition.
During the fifth and sixth weeks of the semester	50 per cent of the total tuition.

Summer Session

During the first week of the session	Tuition less \$5.00 registration fee for each course.
During the second week of the session	60 per cent of the total tuition (A minimum of \$5.00 for each course will not be refunded.)
During the third week of the session	50 per cent of the total tuition.

Refunds are computed as of the date that the application for withdrawal is received in the Business Office. In no case can tuition be reduced or refunded because of non-attendance at classes. No refund is made of laboratory or other incidental fees.

Because commitments for instruction and other arrangements are necessarily made at the beginning of the semester, no refunds for any reason can be made except in accordance with the schedule.

The Graduate School reserves the right to cancel any course if registration does not warrant continuance; to limit, to discontinue, to postpone, or to combine classes; to change instructors; to change classroom assignments; to make any changes deemed advisable in registration and in fees; and to require the withdrawal of any student at any time for such reasons as the Graduate School deems sufficient.

Programs

SPECIAL PROGRAM

The special program of the Graduate School is designed to develop special educational offerings in cooperation with one or more Federal departments and agencies. Such offerings include conferences, specially developed courses, institutes, pilot programs, seminars, short courses, and workshops. All these are intended to assist Federal departments and agencies in meeting new, difficult, and changing educational and training needs.

Among the special activities regularly operative in the Graduate School are management development programs for Federal executives and field managers, statistical methods for Federal executives, automatic data processing seminars, and others. Other special courses include technical writing, supervision and management, power systems engineering, servomechanisms, and Federal personnel management.

For more information about the special program, contact the Assistant Director, Graduate School, U. S. Department of Agriculture, Washington 25, D. C.

CORRESPONDENCE PROGRAM

The correspondence program of the Graduate School is designed primarily for field employees of the Federal departments and agencies. However, the courses are open to others as facilities permit. In addition, there are many correspondence courses offered by colleges and universities that are useful for Federal employees. The Graduate School is happy to assist a student in locating such courses.

The courses offered by the Graduate School are listed beginning on page 101 of this *Catalog*. For additional information, write to the Registrar, Graduate School, U. S. Department of Agriculture, Washington 25, D. C.

INTERNATIONAL PROGRAM

The international program of the Graduate School is designed for officials from other countries who come to the United States for study. The courses are tailored to the needs of the individuals in the group in so far as possible. These courses are offered in cooperation with, and at the request of, the Agency for International Development. Courses concerned with public administration, personnel management, office management, administrative management, and other needs of the developing countries have been given.

For additional information, contact the Manager, International Program, 1028 Connecticut Avenue, N.W., Suite 1100, La Salle Building, Washington 6, D. C.

PUBLIC LECTURES

The Graduate School presents public lecture series on current problems in agriculture and science, as well as in national and international affairs for employees of the Federal departments and agencies and others. Lectures that relate directly to the needs and interest of Federal employees are given during official working hours.

PUBLICATIONS AND PRESS

The publications of the Graduate School include:
A general annual *Catalog*.

An annual *Special Program Bulletin*.

A schedule of resident evening courses, issued each semester—fall, spring, and summer.

An annual *Correspondence Bulletin*, listing courses given by correspondence.

Books and pamphlets, published at irregular intervals. These are original contributions by members of the faculty, special lectures devoted to the advancement of the arts and sciences, and significant studies by employees of the Department of Agriculture, which the Department has been unable to publish. A partial list of these publications is in the back of this volume.

RESIDENT EVENING PROGRAM

Courses offered in the resident evening program during the academic year 1963-64 are listed on the following pages by department of instruction. The departments are listed alphabetically.

The word Fall, Spring, or Summer shows the semester in which the course is offered. The number of credits shows the value of the course in semester hours. Bracketed numbers show courses that will not be offered in 1963-64.

Courses numbered 1-100 are non-credit; 100-399, undergraduate; 400-699, advanced undergraduate (senior) and graduate; above 699, graduate only.

Biological Sciences

DEPARTMENTAL COMMITTEE

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Federal Government workers in the biological sciences are increasingly faced with the difficulty of keeping abreast of rapid advances in the application of principles and new gains in basic knowledge. In addition, many other Government workers in fields indirectly related to biology need understanding of basic principles in the biological sciences to work competently in their own fields.

The Department of Biological Sciences offers courses to meet the needs of each of these groups. Unless specifically stated, there is no laboratory work. The instructors are all outstanding specialists from the Federal Government and other research institutions.

1-115. Introduction to Modern Biology

Year, 2 credits each semester

MAURICE M. MARGULIES

Elementary course, at college level, designed for those desiring general knowledge of structure, activities, interrelationships, and origin of plants and animals. Lectures supplemented with demonstrations. Two Saturday field trips or demonstration laboratories each semester. *Prerequisites:* High school biology and chemistry helpful, but not required.

1-126. Medical Terms Simplified

Fall, 2 credits

LOUISE E. BOLLO

Designed for medical coders, librarians, secretaries, and other workers in health field who deal with technical medical terms. Names, causes, and classification of diseases. Study of anatomical location of disease processes. Previous experience in health work helpful, but not required.

1-90. Basic Principles of Laboratory Animal Care

Year, non-credit

BERTON F. HILL and ASSOCIATES

Background of basic biological concepts for animal colony supervisors and caretakers and medical laboratory technicians, especially in relation to common laboratory animals. First semester: Life and living organisms, skeletal, muscular, circulatory, respiratory, digestive, excretory, nervous and endocrine systems, reproduction, genetics and breeding, nutrition, and metabolism. Second semester: Infectious disease, disease control and therapy, sanitation and sanitary procedures, animal handling, practical diagnostic methods, and animal dissection. Students may register for the second semester without having completed the first if they have training in high school biology.

1-95. How Plants Grow

Spring, non-credit

THOMAS R. SODERSTROM

To assist the backyard gardener to understand the plants he grows. Nutrition and reproduction of plants, structure and function of plant parts, characteristics of major plant groups, and plant geography. Presented in nontechnical terms in so far as possible. Some laboratory observation. No prerequisites other than interest and curiosity in biology of Plant World.

1-96. Systematic Botany of Wild Flowers

Summer, non-credit

THOMAS R. SODERSTROM

Elementary nontechnical course, designed to enable the student to determine names and relationships of wild and cultivated plants in vicinity of Washington, D. C. Principally directed laboratory following introductory background lectures. Weekend field trips to nearby areas to learn proper methods of collecting and preserving plant materials and to observe plants in natural surroundings. Laboratory devoted largely to the identification of these collections.

1-325. Forest Entomology

Fall, 2 credits

ARTHUR D. MOORE

Survey course in forest entomology. Brief history. Major groups of forest insects. Detection, diagnosis, and appraisal of damage. Silvicultural, biological, and chemical control, including biological and ecological considerations. Current practices and research.

1-560. Fundamentals of Medical Microbiology

Fall, 3 credits. Repeated in Spring

ALEXANDER KIMLER

Basic aspects of bacteriology, mycology, virology, and parasitology. Lectures on handling of clinical specimens and cultural isolation and identification techniques of specific infectious agents in each group. *Prerequisites:* Some instruction or training in clinical laboratory techniques, and/or special permission.

1-570. Design of Experiments in Biological Sciences

Year, 2 credits each semester

E. JAMES KOCH

Principles of planning and analyzing animal and plant experiments. Basic design principles of completely randomized, randomized block, Latin Square, factorials, confounding, split plot, lattices, incomplete blocks, and other designs. Principles and application of correlation, regression, covariance, multiple regression, experimental and sampling errors, components of variance, missing data, mean separation, individual degrees of freedom, size, or plot, and size of experiment to experimental design. *Prerequisite:* Course in experimental statistics, several years of experience in applying principles of statistics to experimental data, or special permission.

1-603. Advances in Plant Breeding and Genetics

Fall, 3 credits

MARTIN G. WEISS and SPECIALISTS

Methods of breeding naturally self- and cross-pollinated plants. Theories of early generation testing. Nature and use of heterosis in plant breeding. Techniques of self-pollination and hybridization. Plant improvement through interspecific hybridization and polyploidy. *Prerequisites:* Courses in principles of genetics and elementary plant breeding, or equivalent.

1-712. Advances in Applied Nutrition

Spring, 2 credits

RUTH M. LEVERTON

Designed primarily for dieticians, nutritionists, and others interested in human nutrition. Review of present status of field with special emphasis on evaluation of recent findings for applications to nutrition programs. Nutrition problems of individuals, families, and communities. *Prerequisites:* Organic chemistry and biochemistry, or physiological chemistry.

SPECIAL PROGRAM IN NATURAL HISTORY FIELD STUDIES

The following courses form a special program in natural history field studies given in cooperation with the Audubon Naturalist Society of the Central Atlantic States, Inc. These courses are intended to increase knowledge and enjoyment of the natural world around us. They are also designed to help teachers, youth leaders, and parents in presenting subject matter in natural history and conservation. They provide experience in using the outdoors as a classroom and in using natural materials in the school.

The courses are presented at a level to appeal to adults with a high school or college education, but without advanced training in natural sciences. Field trips offer opportunity to observe in nature the subjects studied. The trips are planned to visit all the major ecological communities in the Central Atlantic region in the two-year series.

The student who satisfactorily completes the prescribed program for credit will receive a Certified Statement of Accomplishment in Natural History Field Studies. Any of the courses may be taken separately, but the entire series is planned as an integrated unit to provide an understanding of the ecology of the Central Atlantic region. Although there are no formal prerequisites for any of the courses, the student can expect maximum benefit from taking them in the order listed.

FIRST YEAR

1-130. Physical Environment of Central Atlantic Region

Fall, 2 credits

EARLE D. MATTHEWS, BEN O. OSBORN, and MARVIN A. PISTRANG

Climatic characteristics of region and weather dynamics that produce climate. Principal geologic features and geologic history. Major soil groups and areas. Evenings and Saturday field trips.

1-131. Basic Biology

Fall, 1 credit

ROBERT TRAVIS

Structures and functions of plants. Review of characteristics of representative plant families. Evolving patterns of animal forms, stressing adaptation of structure and function to the animal's environment and way of life. New concepts and trends in biology.

1-132. Introduction to Outdoors

Fall, 1 credit

LEWIS A. BUCK, A. B. FOSTER, BEN O. OSBORN, and MARVIN A. PISTRANG

Outdoors as environment for man. Ecological point of view applied to study of nature and use and conservation of natural resources. Recreational and scientific uses of wilderness and inhabited areas. Methods and practices of nature study and other forms of outdoor recreation. Use of field identification guides. Practical dress and equipment for outdoor living. Elementary course designed especially for those with little outdoor experience. Also recommended as preview of scope and viewpoint of entire field studies program. Not required for Certified Statement of Accomplishment. Saturday field trips, including optional overnight camping trip.

1-133. Introduction to Ecology

Spring, 1 credit

BEN O. OSBORN and ROBERT E. WILLIAMS

Survey of fundamental principles of ecology. Factors and dynamics of relations of organisms to their environment. Classification of ecological communities and methods of studying them in the field. Lectures and discussion designed to prepare the student for field study of biotic communities. No prerequisites, but a course in basic biology (Introduction to Modern Biology or Basic Biology) is good preparation.

1-134. Animal Behavior

Spring, 1 credit

INSTRUCTOR TO BE ANNOUNCED

Introduction to behavior of principal classes of animals found in Central Atlantic region, with emphasis on insects and birds. Patterns of instinctive and learned responses in animals. Territory, courtship, migration, and family, social, and predatory relations in birds and animals.

1-135. Biotic Communities: Aquatic and Marsh Communities

Spring, 1 credit

BROOKE MEANLEY and PAUL SPRINGER

Field study of fresh water streams, ponds, and marshes. Brackish estuaries and bays. Salt-water marshes and ocean beaches and dunes. No prerequisites, but basic courses in physical environment and ecology (Physical Environment of Central Atlantic Region and Introduction to Ecology) are good preparation. Saturday field trips, including overnight trip to Eastern Shore.

SECOND YEAR

1-136. Nature Teaching and Leadership Techniques

Fall, 1 credit

GEORGIA A. BUCK and JOHN L. TROTT, JR.

Techniques of presenting natural history and conservation subjects in the classroom and making the outdoors a laboratory for the class. Essentials of leading adult and youth groups on natural history field trips. Short Saturday field trips.

1-137. Conservation Ethic

Fall, 1 credit

SHIRLEY A. BRIGGS

Critical reading and discussion of conservation classics. Study of evolution of concept of conservation as revealed in works of Powell, Leopold, and others. Development of conservation ethic for individual and for society.

1-138. Biotic Communities: Deciduous Forests

Fall, 1 credit

BEN O. OSBORN and ROBERT E. WILLIAMS

Field studies of climax, second-growth, and early successional stages of Oak-Chestnut forest, including sites in agricultural use. Oak-Hickory and Mixed Mesophytic forests. Bottomland and swamp forests. Saturday field trips. No prerequisites, but basic courses in physical environment and ecology (Physical Environment of Central Atlantic Region and Introduction to Ecology) are good preparation.

1-139. Wildlife Populations and Their Distribution

Spring, 1 credit

WINSTON E. BANKO

Dynamics of wildlife populations and factors that control their survival and abundance. Factors controlling geographical distribution of wildlife. Examination of phenomena and theories of migration.

1-140. Principles and Practices of Land Use

Spring, 1 credit

EARLE D. MATTHEWS and BEN O. OSBORN

Economic, social, political, ecological, and physical principles that govern how land is used. Practices through which principles are applied to land in different uses. Application of conservation principles to land resource use. Two Saturday field trips.

1-141. Biotic Communities: Coniferous Forest Mixtures

Spring, 1 credit

BEN O. OSBORN and ROBERT E. WILLIAMS

Field study of climax, second-growth, and early successional stages of Oak-Pine forests of Coastal Plain, Piedmont, and Blue Ridge, including sites in agricultural use. Northern coniferous and deciduous forest mixtures of Allegheny Mountains. Saturday field trips, including overnight trip to Allegheny Mountains. No prerequisites, but basic courses in physical environment and ecology (Physical Environment of Central Atlantic Region and Introduction to Ecology) are good preparation.

OPTIONAL COURSES

The following courses supplement the prescribed program for the Certified Statement of Accomplishment in Natural History Field Studies, but are not required for the certified statement.

1-142. Plant Identification

Spring, 1 credit

STANWYN G. SHETLER

Introduction to principles of plant taxonomy and techniques of plant collection and identification. Study of herbarium specimens of principal vascular plant families of Central Atlantic Region. Laboratory practice in identifying specimens.

1-143. Insect Life

Spring, 1 credit

FLOYD P. HARRISON

Introduction to identification of principal insect families of Central Atlantic Region, and their life histories and ecology.

SPECIAL PROGRAM IN PLANT QUARANTINE STUDIES

The following courses form a special in-service training program in plant quarantine studies. They are given at the New York City facilities of the Division Training Center, Plant Quarantine Division, Agricultural Research Service. The program is under the supervision of Ira A. Lane, Employee Development Officer, Plant Quarantine Division, Agricultural Research Service.

1-515. Plant Quarantine Entomology

Schedule to be arranged, 6 credits

MAYNARD J. RAMSAY and ASSOCIATES

Concentrated and technical course in entomology, especially designed to enable qualified and experienced selectees to fully identify foreign insect pests regularly encountered in plant quarantine work, both in adult and immature stages. To familiarize participant with dissection and mounting techniques for larval skins, genitalia, epipharynxes, and similar precise operations. To acquaint enrollee with current classification and nomenclatural concepts in insect orders under consideration. *Prerequisite*: Basic Training for Plant Quarantine Inspectors, or equivalent.

1-535. Basic Training for Plant Quarantine Inspectors

Schedule to be arranged, 10 credits

WILLIAM FRIEDMAN
IRA A. LANE
MAYNARD J. RAMSAY
ERNEST RICHMAN
HAROLD S. SHIRAKAWA
FREDERICK W. WARREN, III

Consecutive 26-week program for new Federal plant quarantine inspectors. Designed to orient the new employee in the Department of Agriculture. Its organization, function, and personnel policies. Basic legislation and other legal authorities affecting plant quarantine operations. Principles of plant quarantine enforcement. Federal-State relationships. Inspection and treatment techniques and procedures. Technical aspects of foreign pest evaluation. Identification and distribution in the fields of entomology, plant pathology, and nematology as applicable to foreign plant quarantine enforcement. Commodity recognition as applicable to plant materials moving in international commerce.

1-615. Plant Quarantine Pathology

Schedule to be arranged, 4 credits

HAROLD S. SHIRAKAWA

Designed for regulatory officials interested in quarantine phytopathology. Emphasis on detection, recognition, and nomenclature of disease-causing organisms frequently encountered in plant quarantine operations, particularly those not known to occur or to be widely distributed in the United States.

1-708. Plant Quarantine and Plant Protection

Schedule to be arranged, 10 credits

ERNEST RICHMAN

For foreign trainees studying plant quarantine methods in United States. Organization of Department of Agriculture and interrelationships of agencies. Regulatory and control organization and policy, basic quarantine legislation, fundamental principles affecting promulgation of quarantines, and restrictive orders. Field observations and participation in operational activities of Plant Quarantine Division at ports of entry. Identification and distribution in the fields of entomology, plant pathology, and nematology as applicable to foreign plant quarantine enforcement. Review and observation of field control projects and plant operations in Northeast, Southeast, and Southwest Regions.

1-709. Plant Quarantine Nematology

Schedule to be arranged, 6 credits

WILLIAM FRIEDMAN
FREDERICK W. WARREN, III

Graduate level study and practice in detection, isolation, preparation, and identification of nematodes of plant quarantine significance. Special emphasis on host relationships, world distribution, and applicable treatments. Guest lecturers.

SPECIAL PROGRAM IN SOIL SALINITY

1-540. Soil Salinity and Reclamation

Schedule to be arranged, 4 to 6 credits

LOWELL E. ALLISON

Graduate course for qualified foreign trainees, emphasizing principles and practices for diagnosis of saline and sodic soil problems. Daily lectures and discussions with emphasis on soil-water-plant relationships and chemical analysis of salt-affected soils and irrigation waters. Trips into irrigated valleys to observe occurrence of saline and sodic conditions, reclamation procedures, land levelling, deep plowing, drainage systems, and crop management under intensive irrigation with saline waters. A 12-week, in-service training source offered quarterly at U. S. Salinity Laboratory, Agricultural Research Service, Riverside, California.

Languages and Literature

DEPARTMENTAL COMMITTEE

J. Kendall McClarren, *Chairman*

Erwin Jaffe, Foster E. Mohrhardt, Rupert F. Mouré, Lionel W. Nelson, Kenneth W. Olson, Franklin Thackrey (*Vice-chairman*)

It is of primary importance for the Federal servant to write and speak effectively. Scientists, technicians, and professional personnel especially need to know how to communicate their knowledge both to the layman and to their associates. In fact, at all levels of the Federal Government, the employee should be competent in writing and speaking. The Department of Languages and Literature offers courses at varying levels to meet these needs.

There are also available programs in editorial practices and library techniques that lead to certified statements of accomplishment.

CERTIFIED STATEMENT OF ACCOMPLISHMENT IN EDITORIAL PRACTICES

A Certified Statement of Accomplishment in Editorial Practices is granted to a student who has completed an organized program intended to provide basic training for responsible editorial and publications work. This program should be of special interest to those who want to enter editorial work and to those in editorial or publications work who want to prepare for advancement. A good educational background is essential for success in this profession. It is recommended that a student working toward the certified statement should preferably have an undergraduate degree, or at last two years of college work, or at minimum creditable work experience in a subject-matter field. An applicant for the certified statement must file a transcript of his high school or college record before completion of his program.

Requirements

1. Demonstrated facility in English grammar and composition. This requirement can be met by successful completion of an examination to be given as a part of the course, *Principles of Editing and Their Application*.
2. 24 semester hours of credit with an average grade of B or better in the following courses:
 - a. Required courses: (15 credits)
 - Principles of Editing (3)
 - Intermediate Editing (3)
 - Printing, Layout, and Design (2)
 - Editing Technical Manuscripts (2)
 - Producing the Popular Publication (2)
 - Advanced Practice in Editing (3)
 - b. Editing Electives: (6 credits)
 - Basic Reference Service and Reference Tools (2)
 - Feature Writing (2)
 - Graphic Arts in the Federal Government (4)
 - Graphic Methods of Presenting Statistics (2)
 - Indexing (2)

- Introduction to Bibliographic Science (2)
- Maps and Charts (2)
- Official Writing (2)
- Technical Writing (2)
- Written Word in Official Communication (2)

Other courses may be approved depending upon the needs of the student.

- c. Subject-Matter Electives: Remaining hours of credit in subject-matter courses as recommended by the student's employer or as chosen by the student. May be selected from the Editing Electives listed above if appropriate to the position for which the student is preparing. This requirement can be waived for students who have college work or acceptable experience in a subject-matter field.

A student seeking this certified statement should consult with the Registrar and obtain approval of his proposed course of study early in his academic program. Equivalent courses will be accepted by transfer from other institutions.

CERTIFIED STATEMENT OF ACCOMPLISHMENT IN LIBRARY TECHNIQUES

A Certified Statement of Accomplishment in Library Techniques is granted to a student who has completed an organized course of study intended to provide basic training in this field. Graduation from high school, or the equivalent, is the minimal educational background required. An applicant for the certificate must file a transcript of his high school or college record before completion of his certificate program.

Requirements

1. Demonstrated facility in English grammar and composition. This requirement can be met by the successful completion of an examination given as part of the course, Introduction to Library Service.

2. 20 semester hours of credit with an average grade of B or better in the following courses:

- a. Required courses: (15 credits)
 - Introduction to Library Service (2)
 - Introduction to Cataloging and Classification (2)
 - Cataloging and Classification II (2)
 - Principles of Library Organization (2)
 - Basic Reference Service and Reference Tools (2)
 - Introduction to Bibliographic Science (2)
 - Library Techniques—Seminar (3)
- b. Electives: (5 credits)
 - A Foreign Language
 - Administrative Procedure (2)
 - Documentation (2)
 - Indexing (2)
 - Information Practice in Science and Technology (2)
 - Law Librarianship (2)
 - Literature of Meteorology (2)
 - Maps and Charts (2)
 - Medical Terms Simplified (2)
 - Official Writing (2)
 - Principles of Editing and Their Application (3)

Other courses may be approved depending upon the needs of the student.

A student seeking this certificate should consult with the Registrar and obtain approval of his proposed course of study early in his academic program. Equivalent courses will be accepted by transfer from other institutions.

English—Grammar and Writing

2-25. Effective Study and Learning Efficiency

Fall, non-credit.

GEORGE R. J. WEIGAND

Designed to teach improved techniques and methods of learning process and to reduce to minimum learning time and effort. Also useful for the student who wishes to demonstrate his ability on tests.

2-95. Improving Reading Ability

Fall, non-credit. Repeated in Spring and Summer

SALLY D. BEST

JEROLD N. WILLMORE

Developmental reading for average and superior reader. Designed to increase selectivity, flexibility, purpose, and speed. Individualized training. Analysis of reading, vocabulary, and visual abilities to help determine areas needing development. Workbook exercises, periodic evaluation of progress, short talks on principles of efficient reading, and practice for individual needs. Final test to determine progress and areas needing further development.

2-35. English for Secretaries—Rapid Review

Summer, non-credit

ALLEN H. JONES

Sentence structure, capitalization, punctuation, vocabulary, and spelling.

2-38. English for Foreigners

Fall, non-credit. Repeated in Spring

WILLA B. WEEKS

Reading and understanding English. Pronunciation exercises, grammar, vocabulary building and conversation, and idiomatic usage. Early intermediate level. Some knowledge of English essential.

2-42. Conversational English for Foreigners

Summer, non-credit

WILLA B. WEEKS

Intermediate to advanced, including grammar, idiomatic structure, and phonetics. Everyday speech vocabulary, with dialogues covering many situations.

2-112. Practical English Usage

Fall, 2 credits. Repeated in Spring and Summer

ALLEN H. JONES

KATHRYNE B. KOZAK

DOROTHY P. PRITZKER

ROBERT C. REED

Refresher course in English grammar and usage. Exercises in analyzing sentences to give the student basic knowledge of sentence structure and grammar required for more advanced courses in grammar and writing. Exercises in correct usage and punctuation.

2-119. Vocabulary Building

Fall, 3 credits. Repeated in Spring and Summer

ALLEN H. JONES

Study of sources and origins of words to gain insight into present meanings. Principles of word formation, dictionary study, and exercises in word selection. Emphasis on common Latin and Greek roots used in forming English words.

2-222. English Composition

Year, 3 credits each semester

LOUIS A. DE CATUR
ALLEN H. JONES
ROBERT C. REED

Equivalent of college Freshman English. Introductory course in writing and English usage, designed especially for those who need a course preparatory to more advanced English studies, and for those who want to learn techniques of expository writing. Fundamentals of good writing. Exercises in writing short and long themes and in studying, analyzing, and evaluating selected English prose texts. *Prerequisite*: High school English.

2-223. College Grammar

Fall, 3 credits

SUSAN E. HARMAN

Grammatical principles, stressing sentence structure and correct English form. Study of sentence structure through diagramming and of correct English form through detailed discussion and examination of parts of speech. Lectures on history and development of inflectional and derivational forms. Analysis of examples of good and bad English. *Prerequisite*: English Composition, or equivalent.

2-230. Sentence Revision

Spring, 2 credits

DOROTHY P. PRITZKER

Designed for the student who wishes to improve his writing. Review of grammatical elements of sentence, study of established patterns of sentence construction, and constant practice in rewriting sentences. *Prerequisite*: College Grammar, or equivalent.

2-250. College Rhetoric

Spring, 3 credits

EDWARD F. JAMES

Advanced English composition. Designed to enable the student to develop clear, concise, and effective writing style. Study and application of art and principles of composition. Stress on effective use of language and vocabulary. Examination of four basic types of discourse: Exposition, argument, description, and narration. Emphasis dependent upon needs and interests of students. Course in writing. Assignment of composition almost every week. *Prerequisite*: English Composition, or equivalent.

2-226. Official Writing

Fall, 2 credits. Repeated in Spring

JON F. GREENEISEN
JAMES H. MCCORMICK
HAL R. TAYLOR

Designed for those who have to write as part of their jobs, but who are not necessarily professional writers. Stresses that official Government writing, as all writing, should be clear, simple, concise, and easy to understand. Emphasis on eliminating unnecessary words and phrases in official writing. Covers many forms of Government writing including articles, reports, letters, and memoranda. Several short writing assignments. *Prerequisite*: English Composition, or equivalent in writing experience.

[2-227.] Written Word in Official Communication (1964-65,
and alternate years)

Spring, 2 credits

JON F. GREENEISEN
JAMES H. MCCORMICK
HAL R. TAYLOR

Continuation of Official Writing. Stress on writing as effective tool in official communication. Designed to meet needs of nonprofessional writers who prepare reports, scripts, and releases requiring working knowledge and application of writing techniques. Pre-writing including gathering, organizing, and outlining basic subject matter. Drafting including logical development into informative prose of the materials outlined. Reviews of order of arrangement and content, style, structure, and readability. Emphasis on practice in writing. *Prerequisite*: Official Writing, or equivalent.

2-235. Fiction Writing

Fall, 2 credits. Repeated in Spring

OLGA MOORE ARNOLD

Stress on such fiction fundamentals as plotting, characterization, dialogue, story organization, testing readability and interest, and increasing dramatic quality of writing. Emphasis on writing techniques that increase salability of student manuscripts by discussing editorial taboos, ways to obtain salable story ideas, and to market manuscripts.

2-242. Advanced Fiction Writing

Spring, 2 credits

OLGA MOORE ARNOLD

Discussion, criticism, and suggestions for revising the student manuscript. Emphasis on methods of slanting for particular markets, discussion on what editors buy and why, and ways to polish manuscripts to increase sales possibilities. *Prerequisite*: Fiction Writing, or equivalent.

2-280. Feature Writing

Fall, 2 credits

MARIE A. DOLAN

Introduction to feature article writing. Experience in writing articles for magazines and newspapers through learning fundamentals. How to find salable article ideas. How to do research necessary for article material. Feature writing techniques, market analysis, slanting for particular magazines, and polishing and preparing articles for publication.

2-281. Advanced Feature Writing

Spring, 2 credits

MARIE A. DOLAN

Workshop course devoted to discussion, criticism, and suggestions for revising and polishing the student manuscript. Emphasis on development of the student in writing and selling articles on specialized subjects of his choice for general or popular periodicals. *Prerequisite*: Feature Writing, or equivalent.

2-450. Technical Writing

Fall, 2 credits. Repeated in Spring

CARLETON E. BRETT
ROY A. CARTER
WARD W. KONKLE
RUTH NORDIN

Designed to help the scientist and economist improve their research reports and articles for professional publications. Survey of fundamentals of writing the technical report: its characteristics, parts, functions, steps in preparation, and process of criticism. Preparation, criticism, and revision of reports and articles—written for official use when possible. *Prerequisite*: Undergraduate degree in one of the sciences, engineering, economics, or other technical field.

4-330. Government Letter Writing (See P. 47)

4-421. Writing Procedures and Instructions (See P. 48)

Literature

2-330. Great Books

Year, 2 credits each semester

M. CLARE RUPPERT

Group discussion of important works in poetry, history, philosophy, and criticism. A leader helps with the reading and understanding, but the books themselves are the teacher. Designed to give insight into perennial, and therefore contemporary, problems. Interest in ideas and belief in free discussion required. Most books read in entirety. Discussion centers around the following authors:

Reading List A (1964-65 and alternate years)

Fall Semester: Bible, *Ecclesiastes*; Homer, *Iliad*; Aeschylus, *Oresteia*; Sophocles, *Oedipus at Colonus*; Plato, *Symposium* and *Republic*, Bk. VI-VII; Aristotle, *Ethics*; Thucydides, *History of the Peloponnesian War*; Epictetus, *Discourses* (Selections); Lucretius, *On the Nature of Things*.

Spring Semester: Bible, *Gospel According to St. Matthew*; Shakespeare, *Macbeth*; Milton, *Areopagitica*; Adam Smith, *Wealth of Nations*; Descartes, *Discourse on Method*; Swift, *Gulliver's Travels*; de Tocqueville, *Democracy in America*; Thoreau, *Civil Disobedience*; Kant, *Perpetual Peace*; Mill, *On Liberty*; Twain, *Huckleberry Finn*.

Reading List B (1963-64 and alternate years)

Fall Semester: *Declaration of Independence*; Bible, *Book of Job*; Homer, *Odyssey*; Sophocles, *Antigone* and *Oedipus Rex*; Plutarch, *Lives: Alexander and Caesar*; Plato, *Apology* and *Crito*; Aristotle, *Politics*, Bk. I; Marcus Aurelius, *Meditations*; St. Augustine, *Confessions*; St. Thomas Aquinas, *On the Law*.

Spring Semester: Dante, *Divine Comedy*; Machiavelli, *The Prince*; Shakespeare, *Hamlet* and *King Lear*; Hobbes, *Leviathan*; Rousseau, *Social Contract*; Locke, *Civil Government*; *Federalist Papers*; Marx, *Communist Manifesto*.

2-331. Significant Books of the Twentieth Century

Summer, 2 credits

M. CLARE RUPPERT

Books discussed in light of their influence upon twentieth century man, his thought and behavior in our contemporary society.

Reading List

James, *Pragmatism*; Frazer, *Golden Bough*; Dewey, *Democracy and Education*; Keynes, *Economic Consequences of the Peace*; Proust, *Remembrance of Things Past* (vol. I); Joyce, *Ulysses*; Mann, *Magic Mountain*; Spengler, *The Decline of the West*; Freud, *Basic Writings*; Toynbee, *Study of History* (1 v. abridged)

2-337. Literary Masterpieces of Orient

Year, 2 credits each semester

REZA ARASTEH

Understanding of thought of Orient as expressed by its poetry, philosophy, and religion, especially mystical thought. Identification of universal human problems and development of insight into human situation. Comparative approach. Some acquaintance with Western literature and philosophy necessary.

Information Methods

2-220. Indexing

Fall, 2 credits

KATHRYNE B. KOZAK

Indexing primarily for periodicals, bulletins, reports, and books. Emphasis on general procedures and matters of policy as well as on basic principles and techniques. Specific types of indexing adapted to various subjects and popular style, contrasted with technical and scientific styles. Examples of different kinds of indexes. Practical work in preparation of indexes, including making of cross references, alphabetizing, and editorial preparation of index cards and manuscripts for printer. Knowledge of library or editorial work desirable.

2-225. Principles of Editing and Their Application

Fall, 3 credits. Repeated in Spring

H. NELSON FITTON
CATHERINE F. GEORGE

Primarily survey course for those seeking information on editorial techniques involved in handling manuscripts after they leave the author and until issued in printed form. Discussion of fundamental principles of editing, including style (based on *Style Manual* of Government Printing Office), grammar, rhetoric, readability, organization, printing techniques, marking type, copyfitting, and proofreading; and considerations governing tables, charts, photographs, indexes, bibliographies, footnotes, and other parts of a publication. Opportunity to apply principles through practical work in editing. Good knowledge of grammar essential.

2-239. Intermediate Editing

Fall, 3 credits. Repeated in Spring

JEROME H. PERLMUTTER

Follows Principles of Editing and Their Application. Designed to give the student who is in or expecting to enter editorial work practical exercises and experiences in important editing situations. Emphasis on various types of manuscripts and reports that require the editor's attention. How-to-do-it aspect of editing, with step-by-step guidance in fundamentals. Basic editorial terminology and shortcuts to more effective editing. Case histories in publications problems. Slides, motion pictures, and other visuals used. Class workshops to assist the student in applying editorial techniques to manuscripts. *Prerequisite*: Principles of Editing and Their Application, or working editor.

2-237. Printing, Layout, and Design

Spring, 2 credits

ELMO J. WHITE

Designed for those who plan, prepare, or procure printing, duplicating, distribution of books, pamphlets, folders, posters, charts, forms, and other printed or duplicated matter. Printing processes and printing media. Composition. Book binding. Typography and design. Printing types. Illustrations, including photo-engraving process and photographs. Printing design, rough layouts, finished layouts, and methods of copy fitting. Printing for the Government, including agency responsibility, Government Printing Office responsibility, and agency procedure for procuring printing. Other printing media, including silk screen, ozalid, varitype, cold-type processes, and others. Regulations and specifications of the Joint Committee on Printing, Government Printing Office paper catalog, *Style Manual*, printing, and binding regulations.

2-412. Editing Technical Manuscripts

Fall, 2 credits

JAMES E. REYNOLDS

Role of editor, including necessary qualifications, human relations aspect, relative responsibilities of editor and author, and ethical and practical basis for editing. Editorial evaluation of technical manuscripts, including organization of functional parts, sound procedural reasoning, correlation with technical work, style requirements, critical review, and preparation for reproduction. *Prerequisite*: Principles of Editing and Their Application, or equivalent.

2-415. Producing Popular Publication

Fall, 2 credits

DENNIS S. FELDMAN

Between the final editing and the time a pamphlet, brochure, or periodical comes off the press lies a multitude of details designed to enhance the appeal of the publication. The picture editor who lends his talents to make a publication come alive; the artist and layout man who create visual appeal; the caption writer—all these key personnel bring their specialized skills to bear. Examination of these fields by means of lecture and workshop. Techniques of preparing a manuscript for mass as well as for specialized audiences. Emphasis on the use of techniques that combine appeal with readability through extensive use of graphic materials. Review of production of low-budget publications. Students may bring to class problems or materials on which they are currently working. *Prerequisite*: Principles of Editing and Their Application, or equivalent.

2-360. Advanced Practice in Editing

Spring, 3 credits

GENIANA R. EDWARDS

Advanced instruction in literary and statistical editing and integration of graphics. Editing of practice manuscript, requiring reorganization, extensive editing, and uniform styling. Preparation of manuscript for printer and proofreading. Comparison of several Government agency styles for citations, tables, graphics, and other details. Adaptation of style to meet special requirements under rules of Government Printing Office. Administrative control of manuscript and proof in editorial offices. *Prerequisite*: Principles of Editing and Their Application, or equivalent.

2-150. Information Practice in Science and Technology

(See P. 27)

2-152. Documentation

(See P. 27)

2-243. Using Visuals Effectively

Fall, 2 credits. Repeated in summer

DAVID M. GRANAHAN

Designed for those who teach, conduct meetings, or plan visual programs for groups or mass communication. Emphasis on planning and creating simple but effective visuals, using modern techniques and devices. Analysis of an audience. Development of visual ideas. Application of modern techniques. Demonstrations in use of motion pictures, closed circuit Television, three-dimensional visuals, visual cast, and other speaker-controlled devices. *Background in art not necessary.*

Library Techniques

The following are nonprofessional library courses. They offer background information and training for the subprofessional library assistant and others whose work requires knowledge of library techniques.

2-125. Introduction to Library Service

Fall, 2 credits

KIRBY B. PAYNE and ASSOCIATES

Basic course for those expecting to pursue curriculum leading to nonprofessional certificate. Outlines purposes, procedures, techniques, development, and trends of librarianship. Individual assignments and conferences with students working toward the certificate. *Prerequisite*: Practical English Usage, or equivalent determined by basic English examination given prior to acceptance in course.

2-135. Introduction to Cataloging and Classification

Fall, 2 credits

SALME H. KURI
ELIZABETH L. TATE

Organization of library material. Card catalog and auxiliary records. Cataloging rules and routines. Review of cataloging systems. Classification routines and review of classification systems.

2-139. Cataloging and Classification II

Spring, 2 credits

VIRGINIA CUNNINGHAM
SALME H. KURI

Discussion of more difficult problems in descriptive cataloging, classification, and subject headings. Cataloging of practice collection. *Prerequisite*: Introduction to Cataloging and Classification, or one year's library experience.

2-137. Basic Reference Service and Reference Tools

Fall, 2 credits. Repeated in summer

ROBERT M. PIERSON

Designed to help the student learn how and when to use about 90 important or typical reference books or sets of books, such as dictionaries, encyclopedias, indexes, atlases, and yearbooks. Half of each class period is devoted to lecture or drill and remainder to individual work with the books. The student who has not worked in a library or made frequent use of libraries should plan to spend more than the expected four hours of preparation each week, most of it necessarily in libraries.

2-138. Introduction to Bibliographic Science

Fall, 2 credits

JOSEPH T. POPECKI

Bibliographic science and bibliographic style for beginners. Variations and forms of bibliography. Study and comparison of general bibliographic tools and indexes of chief importance.

2-136. Principles of Library Organization

Spring, 2 credits

JOSEPH T. POPECKI

System and function of a library based on component parts and services that obtain regardless of size or purpose. Organization of function and service for utmost efficiency.

2-145. Law Librarianship

Spring, 2 credits

JACK S. ELLENBERGER

Survey of law library administration with emphasis on research methods in primary and secondary authorities, international law, government publications, and work with Federal legislation. *Prerequisite:* Training in law or library work, or equivalent experience.

[2-114.] Maps and Charts (1964-65 and alternate years)

Fall, 2 credits

CATHERINE I. BAHN

Designed to give the analyst, researcher, librarian or teacher working with maps understanding of both domestic and foreign maps and charts, the agencies that produce them, their catalogs and indexes, and their availability in map libraries. Study of United States, foreign, and international mapping activities on workshop basis to permit presentation and solution of individual problems. Pertinent information on map libraries, reference facilities, map acquisition, cataloging and processing procedures and techniques. Presentation of maps, charts, reference materials, aids, and tools for laboratory use.

2-150. Information Practice in Science and Technology

Fall, 2 credits

JOHN SHERROD

Survey of availability and utilization of scientific and technical information from government, industrial, university, and other sources, both foreign and domestic. Review of resources of technical libraries, with particular emphasis on those in Washington area. Discussion of special problems including information retrieval, technical information services, and technical report literature.

2-152. Documentation

Spring, 2 credits

JOHN SHERROD

Survey of techniques for locating, organizing, and communicating recorded specialized knowledge. Use of non-conventional systems in bibliographic work and their adaptation for special purposes.

2-160. Library Techniques—Seminar

Fall, 3 credits. Repeated in Spring

JOHN SHERROD

Overall summary and review of practical problems in library operations. Emphasis on work with the individual student. Special readings in literature of librarianship. Open only to the student who has completed all other requirements for a Certified Statement of Accomplishment in Library Techniques, including B average in all courses taken.

Speech

2-228. Public Speaking for Beginners

Fall, 2 credits. Repeated in Spring

NORMA RENO MILLER

For those needing more self-confidence and ability in meeting business, club, church, and social speaking situations. Basic steps in speech preparation and delivery. Emphasis on extemporaneous speech of from one to 10 minutes in length. Twelve or more opportunities for each student to speak and receive written and oral constructive criticism.

2-229. Advanced Public Speaking

Fall, 2 credits. Repeated in Spring

LIONEL W. NELSON

Emphasis on determination of purpose in speaking and accomplishment of that purpose. How to be interesting and clear. How to develop and support ideas. How to handle discussion. Each student speaks and receives suggestions at each class meeting. Course ends with after-dinner speech in banquet situation, involving friends and relatives. *Prerequisite*: Public Speaking for Beginners, or equivalent.

2-232. Voice and Remedial Speech

Fall, 2 credits

BERNIECE C. WARREN

Drill course. Word analysis. Consonant clarity. Phrasing. Pausing. Pronunciation. Voice: power, pitch, inflection, quality, vitality, and stress. Reading from manuscript.

2-246. Voice and Diction

Spring, 2 credits

BERNIECE C. WARREN

Fundamentals as outlined in course description for Voice and Remedial Speech form basis of course. More advanced work presented. May be continuation of Voice and Remedial Speech for the student needing two courses in this area.

2-236. Remedial Speech

Summer, 2 credits

BERNIECE C. WARREN

Techniques to aid in the correction of specific speech problems. Practice course. Individual guidance.

Foreign Languages

The Graduate School provides opportunities for instruction in a wide range of foreign languages. The courses presently available are listed on the following pages. Additional courses in these and other languages can be offered if there is sufficient demand. Students with special interests should consult the Registrar well in advance of the opening of a semester.

2-58. Latin for English

Year, non-credit

ALFRED D. STEFFERUD

Emphasis on learning Latin to improve the student's knowledge of English forms, grammar, vocabulary, and style. Practical, effective workshop in English usage and in skills useful in learning other languages. Attention to cultural values of Latin language and literature. Students encouraged to read novels in English about Rome and the Romans. Simple sentences and passages from the ageless Roman writers read. Recordings of Latin songs and stories played. Help given the student who wishes to develop his scientific vocabulary. No prior knowledge of formal grammar assumed.

2-63. Main Languages of the World

Summer, non-credit

JACOB ORNSTEIN

Intended to familiarize the student with features of the main languages of the world and their geographical distribution. Basic vocabularies presented in French, German, Italian, Japanese, Portuguese, and Russian languages. Discussion of their structures. Role of languages in world affairs. *Prerequisite*: Two years of high school, or one year of college work in a foreign language.

2-200. Elementary Mandarin Chinese (1963-64 and alternate Years)

Year, 4 credits each semester

LIONEL TSAO

Introductory course in written Mandarin Chinese.

[2-201.] Intermediate Mandarin Chinese (1964-65 and alternate years)

Year, 4 credits each semester

LIONEL TSAO

Intermediate course in written Mandarin Chinese.

2-210. Swahili

Year, 3 credits each semester

FREDERICK A. NJENGA

Introduction to sound system and structure of Swahili. Elementary conversation and reading.

French

2-253. Elementary French

Year, 3 credits each semester

GERMAINE BARGIN

Basic grammar and vocabulary. Foundation work in speaking, understanding, reading, and writing French. For beginners.

2-254. Intermediate French

Year, 3 credits each semester

GERMAINE BARGIN

Sequel to Elementary French. Systematic review of French grammar. Continued training in speaking, understanding, reading, and writing French. *Prerequisite*: One year of French at college level, or equivalent.

2-68. Reading French

Fall, non-credit. Repeated in Spring and Summer

GEORGE VICAN

Basic French grammar, reading, and vocabulary building for students who have had some French and wish to review it.

2-87. Basic Conversational French

Fall, non-credit. Repeated in Spring and Summer

GERMAINE BARGIN
MARIE-THÉRÈSE SOMMERVILLE

Designed to impart elementary facility in everyday spoken French. Through practice, the student learns to make himself understood and to follow conversations about family, meals, work, sports, travelling, and other common subjects. Useful for those planning to travel in a French-speaking country. No previous knowledge of French required.

2-255. Advanced French Conversation and Composition

Fall, 2 credits. Repeated in Spring

GEORGE VICAN

Designed to develop fluent style of idiomatic conversation on topics most likely to be met in travelling in French-speaking countries. Grammar review only if deemed necessary. Some composition and dictation exercises. Reading of current French newspapers and magazines. *Prerequisite*: Two years of college French, or equivalent. Good knowledge of grammar and considerable vocabulary.

2-59. Contemporary French Literature and Theater

Fall, non-credit. Repeated in Spring

GEORGE VICAN

Lectures and discussions on trends, thoughts, and problems of present-day French literature and theatre. Selection of one of following for detailed presentation: Camus, Malraux, Sartre, Mauriac, Anouilh, Bernanos, Aragon, Giraudoux, Péguy, Simon de Beauvoir, Maurois, Géraudy. Reading of at least one novel or play. Consideration of special interests and needs of the student. *Prerequisites*: Good background in French and interest in French literature.

German

2-259. Elementary German

Year, 3 credits each semester

MARIANNE LEDERER

Basic grammar and vocabulary. Foundation work in speaking, understanding, reading, and writing German. For beginners.

2-260. Intermediate German

Year, 3 credits each semester

MARIANNE LEDERER

Sequel to Elementary German. Systematic review of German grammar. Continued training in speaking, understanding, reading, and writing German. *Prerequisite*: One year of German at college level, or equivalent.

2-88. Basic Conversational German

Fall, non-credit. Repeated in Spring and Summer

CHARLES V. P. VON LUTTICHAU

Designed to impart elementary facility in everyday spoken German. Through practice, the student learns to make himself understood and to follow conversations about family, meals, work, sports, travelling, and other common subjects. Useful for those planning to travel in a German-speaking country. No previous knowledge of German required.

2-96. Basic Conversational German II

Spring, non-credit

CHARLES V. P. VON LUTTICHAU

Continuation of Basic Conversational German. Practice in conversation to improve vocabulary and fluency. *Prerequisite*: Basic Conversational German, or equivalent.

2-66. Reading Scientific German

Fall, non-credit. Repeated in Spring

MARIANNE LEDERER

MARIE L. FARR

CHARLES V. P. VON LUTTICHAU

Designed to offer the student preparing for advanced degree in biological and physical sciences background for language examination. No previous knowledge of German required.

2-97. Journey Through German Lands

Fall, non-credit

CHARLES V. P. VON LUTTICHAU

Introduction to scene and civilization of German-speaking countries of Europe through their geography, history, politics, economy, and culture. Insight into background of German-speaking countries the student may wish to visit. *Prerequisites*: Basic Conversational German and Basic Conversational German II, or equivalent.

Italian

[2-270.] Elementary Italian (1964-65 and alternate years)

Year, 3 credits each semester

MAGNA E. BAUER

Basic grammar and vocabulary. Foundation work in speaking, understanding, reading, and writing Italian. For beginners.

2-271. Intermediate Italian (1963-64 and alternate years)

Year, 3 credits each semester

VICTOR L. BONDI

Sequel to Elementary Italian. Systematic review of Italian grammar. Continued training in speaking, understanding, reading, and writing Italian. *Prerequisite*: One year of Italian at college level, or equivalent.

2-99. Basic Conversational Italian (1963-64 and alternate years)

Fall, non-credit

MAGNA E. BAUER

Designed to import elementary facility in everyday spoken Italian. Through practice, the student learns to make himself understood and to follow conversations about family, meals, work, sports, travelling, and other common subjects. Useful for those planning to travel in an Italian-speaking country. No previous knowledge of Italian required.

Portuguese

2-290. Elementary Portuguese (1963-64 and alternate years)

Year, 3 credits each semester

JACOB ORNSTEIN

Basic grammar and vocabulary. Foundation work in speaking, understanding, reading, and writing Portuguese.

[2-291.] Intermediate Portuguese (1964-65 and alternate years)

Year, 3 credits each semester

JACOB ORNSTEIN

Sequel to Elementary Portuguese. Systematic review of Portuguese grammar. Continued training in speaking, understanding, reading, and writing Portuguese. *Prerequisite*: One year of Portuguese at college level, or equivalent.

Russian

2-45. Review of Elementary Russian

Summer, non-credit

THEODOSIE SCALA

Review of Russian grammar and its application, with stress upon its relationship to English grammar, wherever possible.

2-295. Elementary Russian

Year, 3 credits

TATIANA W. BOLDYREFF
VICTOR A. FEDIAY
JACOB ORNSTEIN
THEODOSIE SCALA
ANDRE A. ZINOVIEFF

Basic grammar and vocabulary. Foundation work in speaking, understanding, reading, and writing Russian. For beginners.

2-296. Intermediate Russian

Year, 3 credits each semester

VICTOR FEDIAY
THEODOSIE SCALA
ANDRE A. ZINOVIEFF

Sequel to Elementary Russian. Systematic review of Russian grammar. Continued training in speaking, understanding, reading, and writing Russian. *Prerequisite*: One year of Russian at college level, or equivalent.

2-299. Advanced Russian

Year, 3 credits each semester

VICTOR FEDIAY
THEODOSIE SCALA

Reading and translation of more advanced Russian texts. Composition in Russian. Oral and written translation from English to Russian. *Prerequisite*: Two years of Russian at college level, or equivalent.

2-292. Scientific Russian I

Fall, 3 credits

TATIANA W. BOLDYREFF

Designed to develop reading knowledge of scientific Russian. No previous knowledge of Russian required.

2-294. Scientific Russian II

Spring, 3 credits

TATIANA W. BOLDYREFF

Designed to develop reading knowledge of scientific Russian. *Prerequisite*: Scientific Russian I, or equivalent.

Spanish

2-300. Elementary Spanish

Year, 3 credits each semester

ERWIN JAFFE

Basic grammar and vocabulary. Foundation work in speaking, understanding, reading, and writing Spanish. For beginners.

2-301. Intermediate Spanish

Year, 3 credits each semester

JACOB ORNSTEIN

Sequel to Elementary Spanish. Systematic review of Spanish grammar. Continued training in speaking, understanding, reading, and writing Spanish. *Prerequisite*: One year of Spanish at college level, or equivalent.

2-302. Advanced Spanish Conversation and Composition

Year, 2 credits each semester

MANUEL M. STERLING

Designed to develop fluency in idiomatic conversation and to provide thorough training in the structure of the language. Grammar review only if deemed necessary. Writing of compositions commercial and familiar letters. Reading of current newspapers, magazines, and novels. *Prerequisite*: Intermediate Spanish, or equivalent.

2-83. Basic Conversational Spanish I

Fall, non-credit. Repeated in Spring and Summer

JOSÉ OTERO

Designed to impart elementary facility in everyday spoken Spanish. Through practice, the student learns to make himself understood and to follow conversations about family, meals, work, sports, travelling, and other common subjects. Useful for those planning to travel in a Spanish-speaking country. No previous knowledge of Spanish required.

2-84. Basic Conversational Spanish II

Fall, non-credit. Repeated in Spring and Summer

JOSÉ OTERO

Continuation of Basic Conversational Spanish. Continued practice in conversation to improve vocabulary and fluency. *Prerequisite*: Basic Conversational Spanish, or equivalent.

2-70. Latin American Culture

Fall, non-credit

MANUEL M. STERLING

General survey of Latin America through political, social, and economic forces that have shaped its history. Indigenous cultures and cultural legacies of Spain and Portugal, with special attention to cultural movements and trends of thought in nineteenth and twentieth centuries. Readings in Spanish and discussions in English of representative writings by Latin Americans. *Prerequisites*: Elementary Spanish and Intermediate Spanish, or equivalent.

Mathematics and Statistics

DEPARTMENTAL COMMITTEE

B. Ralph Stauber, *Chairman*

Joseph F. Daly, Harold F. Dorn, W. Duane Evans, Morris H. Hansen, Earl E. Houseman, Walt R. Simmons

Unprecedented dependence is being placed on statisticians by administrative officials in Government and in private business all over the world. The statistician, through his specialized training, is able to provide current and comprehensive information as well as specialized judgment on many subjects, and to do so with speed and economy. By applying proper principles of design, he can insure securing the maximum amount of information from a given investment in an experiment or survey. His specialized knowledge and techniques are indispensable in both industry and in Government.

The making of a statistician is a long and exacting process. Several years of graduate study, and at least a year and a half of high-level experience under competent leadership are essential. Educational facilities are strained, not only because of the heavy and increasing demand, but also because the educational requirements placed on the statistician today are of an entirely different order of magnitude than only a few years ago.

Recent years have seen the addition of an array of computing aids that vastly expand the horizon of what is possible in statistical data handling and computation. Computational and data handling operations that were regarded as impossible or even fantastic a few years ago are now routine as a result of the development of the electronic computer. This means that the statistician must be familiar not only with the theoretical principles underlying statistical analysis and the design of surveys and experiments, together with the skills for carrying out the operational phases of such activities. He must also be familiar with the potentialities and application of modern-day equipment for carrying out the computational aspects of his activities.

Accordingly, the courses offered by the Department of Mathematics and Statistics include: Basic mathematics prerequisite to statistics courses, specialized mathematics related to statistics, a wide range of courses in statistics ranging from elementary to advanced, data processing on electronic computers, and supplementary subjects related to the statistical field.

Certified Statement of Accomplishment in Statistics

A Certified Statement of Accomplishment in Statistics is granted to a student who has completed an organized program in one of three fields of statistical study, the social sciences, the natural sciences, or mathematical statistics. These represent areas of statistical preparation and application especially useful in the Federal Government. Completion of one of these programs prepares the student for effective public service in a particular field. Substitutions may be approved under appropriate circumstances.

Requirements

1. An undergraduate degree
2. Basic courses required of all candidates: (15 credits) (for all fields)
College Algebra (4)

Plane Trigonometry (2)

Analytic Geometry (2)

Calculus (4)

Principles of Statistical Analysis (3)

3. 24 semester hours of credit with an average grade of B or better in the following specialized and elective courses:

a. Specialized Courses:

Social Sciences

Introduction to Mathematical Statistics (8)

Elementary Matrix Theory (6)

Sampling in Social and Economic Surveys (3) or Theory of Sample Surveys (4)

Introduction to Population Statistics (3)

Natural Sciences

Introduction to Mathematical Statistics (8)

Statistics in Experimental Research (3)

Elementary Matrix Theory (6)

Design of Experiments in Biological Sciences (4)
or Introduction to Experimental Statistics (8)

Mathematical Statistics

Introduction to Mathematical Statistics (8)

Elementary Matrix Theory (6)

Theory of Sample Surveys (4)

Introduction to Probability Theory (6)

A course in programming an electronic digital computer

b. Elective Courses:

Differential Equations (4)

Introduction to Linear Programming (3)

Non-Linear and Dynamic Programming (3)

Introduction to Operations Research (3)

Special Problems in Operations Research (3)

Non-sampling Errors in Statistical Surveys (2)

Statistics in Experimental Research (3)

A student seeking this certified statement should consult with the Registrar and obtain approval of his proposed course of study early in his academic program. Equivalent courses will be accepted by transfer from other institutions.

Mathematics

3-8. Intermediate Algebra

Fall, non-credit. Repeated in Spring and Summer

ALAN O. PLAIT

RICHARD J. SCHRIMPER

Designed primarily for the student with limited background in algebra, or who has been away from algebra for a number of years and needs a refresher course. Fundamental operations of addition, subtraction, multiplication, and division. Factoring. Fractions. Linear equations in one unknown. Functions and their graphs. Systems of linear equations. Exponents and radicals. Quadratic equations. Ratio, proportion, and variation. Arithmetic and geometric progressions. Logarithms. Binomial theorem.

3-1. Review of College Freshman Mathematics

Year, non-credit

ANTHONY T. DIAMOND

Review at level of college Freshman mathematics. Algebra, trigonometry, and analytic geometry. Brief introduction to methods of the differential calculus. Emphasis on applications to statistical problems. *Prerequisite*: One year of college mathematics.

3-2. Review of Calculus

Spring, non-credit. Repeated in Summer

J. RICHARD GAUTHEY
PAUL A. GISVOLD
KEITH G. LAKEY

Variables, functions, limits, divided differences, derivatives, application of derivatives to geometry as well as engineering curve fitting and analysis. Transcendental functions, polar equations, differentials, mean value theorem, techniques of integration, and engineering application. Series and expansion of functions. *Prerequisite*: Calculus.

3-102. College Algebra

Fall, 4 credits. Repeated in Spring

JAMES B. McCURLEY

Number system of algebra. Algebraic expressions. Elementary graphical methods. Operations with polynomials. Fractional expressions. Linear equations. Fractional exponents. Radicals and complex numbers. Quadratic equations. Systems of equations in two unknowns involving quadratics. Ratio, proportion, and variation. Theory of equations. Determinants. Solution of equations by inverse matrix. Permutations, combinations, and probability. Binomial theorem. Progressions. Infinite geometric series. Inequalities. Logarithms. Mathematics of investment. *Prerequisites*: High school algebra and plane geometry.

3-103. Trigonometry and Analytic Geometry

Fall, 4 credits. Repeated in Spring

JOSEPH L. STEARN

Basic definitions and uses of trigonometric functions. Logarithmic solutions. Radian measure. Fundamental identities. Oblique triangles. Polar coordinates and inverse trigonometric functions. Complex numbers and De Moivre's theorem. Graphs of functions and inverse functions. Introduction to spherical trigonometry. Fundamental concepts and formulas. Line, circle, parabola, ellipse, and hyperbola. Transformation of coordinates. Polar coordinates. Parametric equations. Second and higher degree equation in rectangular coordinates. Graphic solution of equations. Introduction to solid analytic geometry. *Prerequisite*: College algebra.

3-104. Trigonometry

Summer, 2 credits

JOSEPH L. STEARN

Basic definitions and uses of trigonometric functions. Logarithmic solutions. Radian measure. Fundamental identities. Oblique triangles. Polar coordinates. Inverse trigonometric functions. Complex numbers and De Moivre's theorem. Graphs of functions and inverse functions. Introduction to spherical trigonometry. *Prerequisite*: College algebra.

3-206. Calculus

Year, 4 credits each semester

BRUCE W. BENSON
J. RICHARD GAUTHEY
PAUL A. GISVOLD
WILLIAM J. HUSSONG, JR.
KEITH G. LAKEY

First semester: Variables, functions, limits, continuity, derivatives. Applications of the derivative to geometry and physics. Maxima and minima. Differentials. Mean value theorem. Simple integration and applications to geometry and physics. Radius and circle of curvature. Vectors. Second semester: Standard integral forms. Special methods of integration. Approximate integration. Improper integrals. Indeterminate forms. Taylor's formula with remainder. Infinite series. Partial derivatives. Multiple integrals. *Prerequisites*: College algebra, trigonometry, and analytic geometry.

3-310. Introduction to Probability Theory

Year, 3 credits each semester

MORTON S. RAFF

Designed for research workers wanting introduction to probability theory and its application to statistical technique. Historical development of various definitions and philosophic points of view of probability and their practical implications for subject-matter application. Elementary theory of sets, combinatorial analysis, conditional probability and Bayes's Rule, discrete and continuous distribution functions, and random variables. Sums of random variables, variance of sums, generating functions, testing of hypotheses, and estimation of parameters. *Prerequisite*: One year of calculus.

3-315. Introduction to Modern Mathematics

Spring, 3 credits

EARL F. CLARK

Modern approach to basic ideas of mathematics, with scientific applications. Finite situations and logical relations as basis for introduction to and consideration of sets and subsets, probability, statistics, vectors and matrices, and game theory, with applications to biological and social scientific problems. *Prerequisites*: College algebra, trigonometry, and analytic geometry.

3-415. Elementary Matrix Theory

Year, 3 credits each semester

LAWRENCE A. GAMBINO

Permutations, vector spaces, inverse of matrix, rank and equivalence of matrices, and homogeneous systems of equations. *Prerequisite*: Differential calculus.

3-502. Differential Equations

Year, 2 credits each semester

EDWARD J. McGRANE

Nature and origin of differential equations. Standard methods of solving ordinary differential equations with sample applications. Linear differential equations with constant coefficients and applications to topics selected by students. Existence and uniqueness of solutions. Simultaneous equations and operational methods. Solutions by power series and methods of Taylor, Picard, and Frobenius. Numerical solution. Partial differential equations and solution of boundary-value problems by Fourier series. Review of calculus as necessary. *Prerequisites*: Differential and integral calculus.

3-508. Theory of Errors

Fall, 3 credits

JOSEPH L. STEARN

Basic concepts in theory of errors and their application to problems in engineering. Designed to give the student sufficient background to find solutions to problems in error theory and least squares. Classification of errors, the Gaussian law of error, normal distribution, rectangular distribution, measures of precision, propagation of errors, method of least squares as applied to observation and condition equations, design of significance tests for acceptance or rejection of observations, simultaneous solution of observation and condition equations, variance-covariance matrix, and alternatives to least squares. First three weeks devoted to introduction to basic fundamentals of matrix calculus. *Prerequisite*: Calculus.

3-509. Mathematics for Economists

Year, 3 credits each semester

ANTHONY S. ROJKO

Aspects of mathematics most useful to economists: Algebra, geometry, differential and integral calculus, differential and difference equations, and matrix algebra. At each stage, use of described mathematical methods to solve problems based on economic theory or analysis. Demonstration of applications of these techniques in fitting equations by least squares, in fitting systems of simultaneous equations, and in using such systems for analytical purposes. *Prerequisites*: Principles of Economics, college algebra, or special permission.

3-532. Introduction to Linear Programming

Fall, 3 credits

CURT F. FEY

Basic theoretical, computational, and applied aspects of linear programming. Background for recognition of problems of linear programming nature, formulation of such problems as linear programming models, and use of proper computational techniques to solve these problems. Understanding of mathematical aspects tying together these elements of linear programming. General linear programming problem, simplex computational procedure, duality theorems of linear programming, transportation problem, assignment problems, production scheduling problems, diet problems, additional applications, relationship between the zero-sum two-person game and linear programming, parametric linear programming, and recent developments. Introductory lectures on matrices, vectors and vector spaces, convex sets, and linear inequalities. *Prerequisite*: Two years of college mathematics.

3-540. Non-Linear and Dynamic Programming

Spring, 3 credits

CURT F. FEY

Basic theoretical, computational, and applied aspects of selected topics in mathematical programming. Convex and quadratic programming. Dynamic programming. Applications to actual problems encountered in management, such as planning, scheduling, and controlling operations and resource allocation. *Prerequisite*: Introduction to Linear Programming, or equivalent.

3-533. Introduction to Operations Research

Fall, 3 credits

LEON H. MILLER, JR.

Perspective and technique for handling operational problems. Basic mathematics useful in operations research, including probability and statistics, optimum distribution of effort, queuing theory, game theory, variational method, and information theory. Assignment of operations research projects. *Prerequisites*: College algebra and calculus. One year of statistics preferable.

3-534. Special Problems in Operations Research

Spring, 3 credits

LEON H. MILLER, JR.

Methods and techniques used in operations research, with emphasis on recent applications of interest. Lectures by specialists in probability, statistics, and Monte Carlo methods, queuing theory, linear programming and game theory, computer applications and simulation, and new developments. *Prerequisites*: Calculus and statistics, or special permission. Introduction to Operations Research desirable.

3-590. Introduction to Cybernetics (1963-64 and alternate years)

Fall, 3 credits

MICHAEL J. PEDELTY

Introductory course for those interested in problems of communication and control in man-made and living systems. Emphasis on fundamentals. Examples drawn from machine control, error-correcting and reliability, control of armed force, labor force, economy, or manufacturing process, control by an organism of physiological "essential variables," and psychotherapy. Control as goal-directed process. Message transmission as selection process. Message reception as biasing of selection process. Law of requisite variety. Very large system. Fundamental limitations on degree of control attainable by scientists or automation. *Prerequisite*: Introduction to Modern Mathematics, or special permission.

3-730. Theory of Graphs

Fall, 3 credits

THOMAS L. SAATY

Theory of graphs with application to mathematics and operations research. Linear programming in terms of network flow. Intuition aided by geometry of graphs. *Prerequisites*: Elementary background in set theory and some experience with mathematical concepts. Rudimentary knowledge of matrices desirable.

3-707. Topics in Non-Linear Mathematics

Spring, 3 credits

THOMAS L. SAATY

Emphasis on rapidly developing field of modern applied mathematics. Occurrence of linearity and non-linearity in mathematics. Non-linear algebraic equations. Non-linear differential, difference, and integral equations. Stability theory. Control theory. Non-linear prediction. *Prerequisites*: Advanced calculus and differential equations.

[3-711.] Automata Theory and Neuromimes (1964-65 and alternate years)

Spring, 2 credits

MICHAEL J. PEDELTY

Theories of information processing, artificial intelligence, and automata theory. Review of set theory and probability theory. Lattices, partitions, and operations on Boolean lattices. Machine intelligence and its implications for design philosophy. Information theory. Information interface in intelligent decision making. Threshold functions, linear separability, reliability, plastic neurons, and need for inhibition. Neurons in real-time control. Conditional probability computers. Functional degeneracy. Probability state variable devices. Error correction and noisy computation channel. Future for communication. Topics from cybernetics and general systems theory. *Prerequisite*: Introduction to Cybernetics, or knowledge of logical design of computers.

Statistics

3-6. Preparatory Mathematics for Introductory Statistics

Fall, non-credit. Repeated in Spring and Summer

WILLIAM E. KIBLER

For the student with inadequate mathematical background who desires to study statistics at introductory level. Basic operations of algebra, fractions, exponents, summation notation, manipulation of algebraic expression, logarithms, graphic representation of equations, solution of simultaneous equations, elements of probability, permutations and combinations, and mathematical expectation. Emphasis on algebra used in statistics. Examples and problems primarily from statistical operations. *Prerequisite*: High school algebra.

3-126. Introductory Statistics

Year, 2 credits each semester. Repeated in Spring and Summer

C. M. PURVES
OTTO RAUCHSCHWALBE
MILTON A. SCHWARTZ
QUENTIN M. WEST
JO BRICE WILMETH

Collection of data. Presentation of data in tables and charts. Different kinds of averages. Dispersion. Introduction to index numbers. Relations between two or more variables. Introduction to correlation theory, regression, and interpretation of samples. Practice in calculations. *Prerequisites*: High school algebra and geometry.

3-135. Elements of Statistical Drafting

Fall, 2 credits

NELSON P. GUIDRY

Drafting involving actual preparation of statistical maps and charts in class. Explanation of short-cut methods in lettering technique and arrangement of component parts of illustrations. Preparation of illustrations in ink ready for publication. Explanation of reduction, reproduction, and color application to statistical maps and charts. The student supplies his own drafting tools.

3-136. Graphic Methods of Presenting Statistics

Spring, 2 credits

NELSON P. GUIDRY

Analysis of statistical data to determine best form for graphic presentation. Application of data to many types of illustrations in several forms of various classes. Preparation of rough pencil layout examples of time series charts, frequency diagrams, graphic correlation charts, pictorial symbol charts, cartograms, and other illustrative examples. Analysis of comparability and evaluation of individual charts and maps in series.

3-318. Machine Tabulation I

Fall, 2 credits. Repeated in Spring

MILTON KAUFMAN

Designed principally for accountants, operators of punch card tabulating equipment, and statisticians. Principles of operation, functions, applications, and limitations of various types of IBM equipment such as card punching and verifying machines (including types 24 and 26), sorters, alphabetic accounting machine (type 402), reproducing punches, and other auxiliary machines. *Instruction in basic wiring of machines.* Alphabetic accounting machine (type 402). Principal Remington Rand punch card tabulating equipment. *Not intended to train in physical operation of machines.*

3-319. Machine Tabulation II

Spring, 2 credits

MILTON KAUFMAN

Designed principally for accountants, operators, statisticians, and supervisors of punch card tabulating equipment. Principles of operation and functions of IBM accounting machines, type 407, and the collating machines, types 77 and 89. *Instruction in wiring of machines including solution of advanced wiring problems.* *Prerequisite:* Machine Tabulation I, or knowledge of basic wiring of tabulating equipment.

3-380. Principles of Statistical Analysis

Year, 3 credits each semester

B. RALPH STAUBER

Foundation for basic concepts and principles of statistical analysis, and development of understanding of their application to scientific investigation. Elementary probability. Binomial, Poisson, and normal distributions. Introduction to sampling. Statistical tests of significance. Simple and multiple correlation. Some theory of determinants with applications to correlation and the inverse matrix. Introduction to analysis of variance and covariance. Elementary principles of design and analysis of surveys and experiments. Use of statistical tables by Fisher, Yates, and others. *Prerequisites:* Working knowledge of algebra, trigonometry, and analytic geometry. Elementary statistics desirable.

3-385. Elements of Statistical Methods

Year, 2 credits each semester

RICHARD P. LEHMANN

Principles underlying statistical methods with particular reference to natural and physical sciences. Elementary probability, distribution of discontinuous and continuous variables, statistics versus parameters, chi-square test, "t" test, correlation, regression, analysis of variance and covariance, and meaning of experimental error and statistical inference. *Prerequisite:* College training in agriculture or biological sciences. College algebra helpful.

3-400. Introduction to Mathematical Statistics

Year, 4 credits each semester

HARRY M. ROSENBLATT

Introduction to modern mathematical statistics as preparation for further work in mathematical statistics for advanced degree, or for certified statement of accomplishment. First semester: Theory underlying mathematical statistics, including fundamental definitions and axioms of mathematical probability, discrete and continuous distributions, and expected values and moments of distributions. Also statistical inference, including sampling distributions, point and interval estimation, and tests of hypothesis. Second semester: Regression theory, experimental designs and analysis of variance, and methods of solution with unknown underlying distribution. *Prerequisites:* Calculus and elementary statistics.

3-405. Statistics in Experimental Research

Fall, 3 credits

HAROLD F. HUDDLESTON

Design, analysis, and interpretation of data from experiments or surveys. Elementary probability relationships, concept of sampling error, determination of sample size and optimum allocation, testing of hypotheses, analysis of variance and covariance, regression, and individual degrees of freedom. Development and application of basic design principles of completely randomized experiments, randomized blocks, Latin square, split plot, incomplete blocks, lattices, factorials, and confounding. Emphasis on applications rather than mathematical theory. *Prerequisite:* Elementary statistics.

[3-435.] Sampling in Social and Economic Surveys (1964-65 and alternate years)

Fall, 3 credits

HAROLD NISSELSON

Nonmathematical survey of sampling theory and practice. Development of basic ideas of statistical sampling, with applications in social and economic surveys. Unrestricted random, stratified, systematic, area and cluster sampling, and subsampling. Discussion of sample designs used in United States and in foreign countries with respect to considerations of statistical efficiency, cost functions, and the administrative limitations imposed on design. *Prerequisite*: Elementary statistics.

3-450. Introduction to Population Statistics

Fall, 3 credits

JACOB S. SIEGEL

Principal sources of population data. Collection and processing of demographic data. Problems of census taking. Measuring quality of population data. Basic methods of measuring and analyzing population size, geographic distribution, composition (age, sex, race, and ethnic composition) and dynamics (natality, mortality, reproductivity, and migration). Principal demographic rates, including crude and adjusted rates. General methods such as standardization, cohort analysis, and interpolation. Nature and use of life tables. Population estimates and projections. *Prerequisites*: Elementary statistics and course in social sciences.

6-343. Statistical Sampling for Financial Management (See P. 72)

1-570. Design of Experiments in Biological Sciences (See P. 14)

3-735. Theory of Sample Surveys

Year, 2 credits each semester

JOSEPH STEINBERG

History of sampling in social surveys. Use of statistical control in improving quality and efficiency of estimates. Calculation of sampling errors. Random, stratified random, purposive, double and systematic sampling. Cost function and choice of sampling unit. Size and type of sample necessary to attain stated degree of precision. Distinction between precision and accuracy. Development of theory of probability as necessary. Contributions of Fisher, Neyman, Yates, Cochran, and others. *Prerequisites*: Calculus and Principles of Statistical Analysis.

3-736. Non-sampling Errors in Statistical Surveys (1963-64 and alternate years)

Fall, 2 credits

LEON PRITZKER

Identification, measurement, and control of errors in reporting and processing statistical data. Mathematical models of non-sampling errors. Identification and measurement of components of response variance and response bias. Identification of sources and components of nonsampling errors. Application to optimum design of survey procedure. *Prerequisites*: Introduction to Mathematical Statistics, or Theory of Sample Surveys, and professional work in survey design or experimental design.

3-025. Federal Statistical Services

Fall, non-credit

WALTER F. RYAN

Federal statistical system: its growth, organization, major characteristics, and functions. Four lecture-seminars meeting from 3:30 to 5:00 P.M. on September 25, October 9, October 23, and November 6. Registration required, but no fees charged.

Automatic Data Processing

4-105. Basic Concepts of Data Processing (See P. 45)

3-559. Electronic Data Processing—General

Years, 3 credits each semester

LEROY L. COOK, JR.
ARTHUR E. NEWMAN
M. H. SCHWARTZ

Designed for subject-matter professional workers desiring technically based understanding of techniques, potentials, and problems of exploiting electronic data processing in their fields. First semester: Oriented mainly to equipment. Organization and components of EDP systems. Programming concepts in machine language and in symbolic representation of machine language. Input/output. Arithmetic. Program logic and control. Distinctions among kinds of machines. Second semester: Oriented mainly to uses. Systems analysis and flow charting. Automatic programming (ForTran, Algol, COBOL, and TabsoI). Representative applications in the Federal Government. Accounting. Statistics. Scientific computation. Information storage and retrieval. Advanced potentials of EDP.

3-552. Data Processing on Electronic Computers—UNIVAC 1105

Year, 3 credits each semester

LEONARD D. MCGANN

First semester: Basic principles of data processing on large-scale digital electronic computers. Number systems. Flow charting. Instruction repertoire for 1105. Function and use of peripheral equipment. Basic programming techniques. Tour of computer installation. Second semester: Input/output logic. Magnetic tapes. Symbolic coding. Compilers, generators, subroutine libraries, and service routines. Solving business problem on 1105. *Prerequisites*: Experience in problem analysis. No computer experience necessary.

3-568. Data Processing on Electronic Computers—UNIVAC 1107

Year, 3 credits each semester

JOHN K. HENDERSON

First semester: Instruction repertoire and peripheral equipment. Second semester: Input/output logic and related software. *Prerequisites*: Mathematical maturity and experience in problem analysis. No computer experience necessary.

3-580. Data Processing on Medium-Sized Advanced Electronic Computers—IBM 7070

Year, 3 credits each semester

JOHN F. MANN, JR.

First semester: Concepts of high-speed digital-stored program computer utilizing advanced technology. Basic arithmetic, logical operations, and introduction to indexing. Basic assembly system, Autocoder basic. Basic programming techniques, flow charting, and problem analysis. Sample problems. Second semester: More detailed discussion of material covered in first semester. Use of magnetic tape as input-output media for tape-oriented 7070. Automatic priority processing, interrupt features, zero elimination, and scatter gather. New concepts involved in using advanced input-output systems. Survey of other programming languages and systems. *Prerequisite*: Accounting or statistical data processing. Training in other stored programmed computers desirable.

3-585. Data Processing on Electronic Computers—IBM 1401

Year, 3 credits each semester

ANN B. HIBAN
JUDITH P. JOHNSON
ALFRED G. MATTMAN
JOHN W. MORTON
JOHN A. TAYLOR
JACQUELYN ZEHRRING

First semester: Basic understanding of capacity and capabilities of IBM 1401. Range of commands executed by the machine. Format of instructions. Preparation of flow charts. Writing of detailed machine instructions. Address modification, with emphasis on input and output. Second semester: Emphasis on automatic coding languages. Tape processing. Random access techniques. Compatibility with other computers. *Prerequisites*: Experience in accounting, or punch card machine work, or statistical data processing, or systems analysis.

3-588. Data Processing on Electronic Computers—IBM 1410

Year, 2 credits each semester

JOAN G. ADOFF
LOUIS ZELLER

First semester: Introduction to high-speed data processing system. Input/output components. Computer capabilities. Repertoire, format, and execution of machine commands. Preparation of flow charts. Writing of detailed program instructions, using both absolute and symbolic language. Second semester: Program loading and testing procedures. Data processing with magnetic tape. Macro instructions. General purpose input/output package routines. Systematizing a data processing project. Automatic programming systems. *Prerequisites*: Training or experience in accounting or statistical fields, or in punch card machine operations.

3-760. Programming Techniques for General Purpose Electronic Digital Computer—Scientific Applications

Year, 3 credits each semester

GEORGE L. GRESSETT

Complete programming system, with emphasis on scientific applications. IBM 709 Data Processing System prototype for programming for single address, general purpose, stored program, digital information processor. Indication of features of IBM 704 and 7090 where applicable. Nature and ability of computers. Basic components. Flow of control. Flow diagramming. Interpretive and compilative systems. Instruction and simple coding techniques. Simple machine decisions. Address modification. Indexing, counting, looping, and non-looping techniques. Number systems. Arithmetic operations. Macro-operations. Open and closed subroutines. Testing (debugging) procedures. Input-output. Production-run techniques. Emphasis on SHARE Operating System (SOS) and FORTRAN System. Tour of computer installation. Preparation of program for SHARE distribution. Analysis of single SHARE routines. *Prerequisites*: Two years of college mathematics, including calculus and linear algebra, or special permission.

Office Techniques and Operations

DEPARTMENTAL COMMITTEE

Henry A. Donovan, *Chairman*

Shirley Barlow, Robert H. Fuchs, Kelsey B. Gardner, Mark M. Kirkham, Terry J. McAdams (*Vice-chairman*), Max P. Reid, Edmund Stephens, William T. Wolfrey

Whatever the fields of interest of the organization—science, technology, public administration, private business—and whether huge in size or small, all depend upon the office worker to facilitate their functions. All workers are important: the stenographer, the clerk preparing purchase orders, the bookkeeper keeping the accounts in order, the clerk skilled in personnel actions, the worker in records management. And the supervisor who is immediately responsible for these various activities is indispensable to the organization.

It is in recognition of the vital importance of adequately trained personnel to fill these needs and to provide opportunity for supplemental and refresher courses in this general field that the Department of Office Techniques and Operations offers the following courses. They are in large measure practical, how-to-do-it courses of interest generally to persons working with these procedures, or who hope to train themselves for such positions. Of course, these courses are also helpful to persons such as supervisors and administrative assistants in positions requiring some familiarity with these procedures and also to persons of higher levels of responsibility who desire to know more of the details of these operations.

CERTIFIED STATEMENT OF ACCOMPLISHMENT IN ADMINISTRATIVE PROCEDURES

A Certified Statement of Accomplishment in Administrative Procedures is granted to a student who has completed an organized program designed to provide basic training in administrative procedures. This program should be of special interest to those already employed in administrative work of the procedural type, those who wish to enter administrative work, and those who wish to become administrative assistants or to head units concerned with administrative procedures. An applicant for the certified statement must file a transcript of his high school or college record before completion of his program.

Requirements

1. Graduation from high school.
2. 16 semester hours of credit with the grade of C or better in each of the courses taken:
 - a. Required courses: (10 credits)
American National Government (3)
7 semester hours from courses above 100 level in Office Techniques and Operations or Public Administration. Courses in accounting may not be included, except for Federal Fiscal Procedure and Federal Government Accounting.
 - b. Elective courses: (6 credits)
Remaining hours of credit may be selected from other courses in Office Techniques and Operations, excluding shorthand. Elementary statistics and a course in automatic data processing may be included.

A student seeking this certificate should consult with the Registrar and obtain approval of his proposed course of study early in his academic program. Equivalent courses will be accepted by transfer from other institutions.

Administrative Procedures

4-101. Everyday Mathematics

Fall, 2 credits. Repeated in Spring and Summer

C. M. MOUSER

Designed for clerical workers called upon to apply fundamentals of arithmetic to their jobs. Emphasis on review of business arithmetic, including fractions, decimals, ratios, and percentages. Special applications to Civil Service and business problems such as bank, cash, and trade discount, profit and loss, payrolls, simple and compound interest, fire insurance, stocks and bonds, property and income taxes, and determination of interest rates charged on time purchases and small loans.

3-8. Intermediate Algebra

(See P. 35)

4-105. Basic Concepts of Data Processing

Fall, 2 credits. Repeated in Spring and Summer

GLENN W. SUTER

Designed to introduce data processing to the student entirely new to the field. Examination of areas of understanding required by nonprofessionals or those interested in programming instruction, but without background experience. Topics: Punched card data processing. Coding systems. Computer and stored program concepts. Data preparation and print-out formats. Methods of problem definition. Data processing terminology. Illustrations of work done by various kinds of equipment and tour of data processing installation.

4-108. Administrative Procedure

Fall, 2 credits. Repeated in Spring and Summer

THOMAS J. HICKEY
CLAUDE R. WRIGHT

Designed for the student who wishes to become a supervisor or administrative assistant, or who has such a position in a small organizational unit. Day-to-day assignments in such units. Preparation of budget data, proper establishment of authority and responsibility, organizational structure, fundamentals of personnel administration, and requirements essential for good supervision. Introduction to administrative planning, administrative procedures, and management generally at lowest organization level, including work reporting and work measurements, work processes, and work control reports. Relation of these studies to budgetary and personnel needs of unit. Theory of staff versus operating jurisdiction over administrative planning.

4-201. Modern Supervisory Practice

Fall, 2 credits. Repeated in Spring

WILLIAM R. VAN DERSAL
NORMAN A. BERG

Designed for supervisors or those interested in becoming supervisors. Study and application of principles of supervision, supervisory techniques, participation, motivation, communications, organization principles, workload analysis, planning, scheduling, work improvement studies, and solving problem cases prepared by students.

4-202. Management—Seminar

Fall, 3 credits. Repeated in Spring

WILLIAM R. VAN DERSAL

Designed for supervisors managing an organization or organizational segment involving subordinate supervisors. Review of basic elements of management. Study of management systems useful in organizations, including systems of career development, training, communications, supervisory development, and administrative control. Reviews of management literature and professional journals.

4-206. Essentials of Good Office Management

Fall, 3 credits. Repeated in Spring

GLENN D. WAGNER

Designed to give better understanding of principles and techniques of effective management and their practical applications. Review of current research and thinking. Comparison of practices in Government and industry. Problems and questions relating to office management: organizing for effective operations, planning and control of work, utilization of office equipment and services, paper-work management, human relations problems, coordinated effort and team work, and effecting improvements.

4-112. Federal Fiscal Procedure

Year, 2 credits each semester

LOUISE M. KRUEGER

Intended to provide comprehensive understanding of basic fiscal and accounting laws, rules and regulations of the Federal Government and their application to specific fiscal activities. Relationship of executive departments with staff agencies, basic fiscal procedural sources. Covers in detail each type of fiscal operation, including use and processing of accounting and fiscal forms, disbursements and collections, and related records and reporting. First semester: General background of laws and regulations. Symbolization of accounts. Processing of payrolls. Handling of leave, retirement, tax, and bonds, and administrative examination of travel and transportation payments. Second semester: Continuation of study of basic laws, rules and regulations covering fiscal and accounting activities, with emphasis on procedures involving disbursements for supplies, equipment, utilities, and other items, use of imprest funds and agent cashiers. Handling of billings, collections, and deposits. Effecting adjustments for errors. Handling claims and uncollectible debts. Responsibilities of certifying officers.

4-113. Federal Property Procedure

Spring, 2 credits

RALPH G. MCINTYRE

For those in personal property work or who wish to enter field. Laws, regulations, principles, and procedures dealing with accountability and control, utilization, and disposal of Federal personal property. Accountability systems, capitalization policies, inventory controls, reports, surveys, and inspections. Development and application of use, replacement, and preventive maintenance standards. Disposal by transfer, donation, sale, abandonment, and destruction.

4-114. Federal Personnel Procedure

Fall, 2 credits. Repeated in Spring and Summer

HENRY C. STARNES

Elementary principles and procedures of Federal personnel administration, including study of Federal personnel structure and organization, rules and regulations of the Civil Service Commission, and other basic procedural sources. Use of personnel forms and records. Civil Service examinations and recruitment. Appointments. Transfers. Promotions. Separations and reductions in force. Suspensions and disciplinary actions. Retirement. Performance ratings. Leave and hours of duty.

4-115. Federal Purchasing Procedure

Fall, 2 credits. Repeated in Spring

TONY M. BALDAUF
FRANK R. ABERNATHY

For those in purchasing work or who wish to enter field. Historical and legal background of Federal purchasing, professional concepts in purchasing, current legal requirements, purchasing procedures from open market and Federal sources of supply, and purchasing techniques. Practical application of such requirements through the preparation of purchase documents. Case problems involving legal or administrative restrictions, or requiring application of purchasing principles.

4-116. Federal Budgetary Procedure: Formulation and Presentation

Fall, 2 credits

ALBERT J. KLIMAN
DALE McOMBER

Designed for the student in budget work, up to and including GS-9, those intending to enter budget work, or others in related fields (accounting, auditing, and the like), interested in development phase of budget procedure. Basic legal and institutional framework, concepts, procedures, and practices involved in preparation of budget estimates, justifications and supplementary materials. Emphasis on budget procedures at bureau or small agency level. Preparation of budget estimate for hypothetical government agency. *Prerequisite*: Familiarity with basic concepts and terminology used in fiscal, accounting, or other financial operations of the Federal Government.

4-118. Federal Budgetary Procedure: Execution and Fund Control

Spring, 2 credits

BRINLEY J. LEWIS
HEBERT G. PERSIL

Designed for the student in budget work, up to and including Grade GS-9, those interested in entering budget work, or others in related fields interested in performance phase of budget procedure. Systems of administrative control under the Antideficiency Act, allotments, apportionments, review of progress in relation to financial plans, related reports, and other aspects of budgetary control over appropriations and funds. Problems and discussion illustrating various steps of budget execution process at bureau or small agency level and review of basic laws, regulations, concepts, and terminology involved.

4-117. Records Management Procedure

Fall, 2 credits

DOROTHY M. LUTTRELL and ROBERT H. LANDO

Introduction to management of records. Basic instruction in processing, maintaining, and servicing records. Designed for the student interested in supplementing his knowledge of mechanics and techniques of records operations, or who desires to enter records management field. Theory and structure of various systems of classifying and filing records. Selection of filing systems based on identification of features of papers and needs of users. Selection and proper use of filing equipment and supplies. How to meet needs of management for documentation and information from records. Detailed instruction in methods of recording and controlling communications. Classifying, coding, indexing, and filing correspondence and other record material. Reference service, including establishment and operation of charge-out and follow-up systems.

4-217. Advanced Records Management

Spring, 2 credits

DOROTHY M. LUTTRELL and ROBERT H. LANDO

Advanced records management. Lectures on applicable management principles and techniques, group discussions of paperwork problems, and case studies illustrating practical solutions. History of growth of Federal records, increase of related paperwork problems, and Government efforts to solve them. Federal laws and regulations governing establishment, maintenance, protection, preservation, and disposal of records. Development and evaluation of records management programs, planning and conduct of records management surveys, inventory and evaluation of records, application of management problems and techniques to records maintenance and disposition problems, development and application of records retention and disposal standards, and retirement, storage, microfilming, and disposal of records. *Prerequisite*: Records Management Procedure, or qualifying experience at Grade GS-5 or above, or special permission.

6-412. Reports and Forms Management (See P. 65)

4-330. Government Letter Writing

Fall, 2 credits. Repeated in Spring

LUCILE N. BOYD

Intended for the student in an administrative position required to handle administrative problems through correspondence. Writing clear, accurate, concise, courteous letters and memoranda. Principles of effective letter writing. Practice in criticizing and revising outgoing correspondence, and in planning and drafting replies to incoming letters. *Prerequisite*: Good foundation in English grammar, vocabulary, and composition through courses or writing experience.

4-421. Writing Procedures and Instructions

Spring, 2 credits

FREDERIC C. OSGOOD

Designed to increase competence in instructional writing. Study and practice of principles and techniques applicable to writing of formal procedures and instructions, especially for codified manuals. Discussion of expository writing, format, style, and use of illustrations. Development of outline for, and preparation, review, and revision of actual instruction. *Prerequisite*: Management of Directives Systems, or experience at Grade GS-5 or above in the composition of written instructions.

CERTIFIED PROFESSIONAL SECRETARY

For the student who plans to take the Certified Professional Secretary (CPS) examination, the following courses may be useful: Business Law, English for Secretaries—Rapid Review, Essentials of Good Office Management, Everyday Mathematics, General Psychology, Human Relations in Administration, Practical English Usage, Principles of Economics, and Modern Supervisory Practice.

Shorthand

The courses in shorthand are designed to offer a program of training for a stenographic career in the Federal service. Each course represents a separate unit of study, in which emphasis is placed on materials similar to those used in the Federal Government. The sequence of courses presents a sound foundation to qualify for the various grades of stenographers in the Federal service.

The student must have a good command of English. Otherwise Practical English Usage should be taken before registering for a shorthand course.

Review of Gregg Shorthand (Anniversary) serves as a rapid review course for the student who has not used his shorthand recently, or who needs additional practice in office dictation. The student who wishes to review Simplified Gregg should enroll in Gregg Shorthand, 60-80 Words.

In order to reach the goals stated in the course descriptions, home study is essential. The amount of study varies with the learning ability and requirements of the individual student.

4-89. Review of Gregg Shorthand (Anniversary), 60-80 Words

Fall, non-credit. Repeated in Spring and Summer

FRANCES A. BUTLER
ELIZABETH T. CARROLL
ILDA DOW

Review of theory and brief forms. Reading from shorthand plates and notes of student. Dictation of standard material at various progressive rates of speed. *Prerequisite*: Completion of the *Gregg Manual*, or its equivalent by Anniversary system. The shorthand writer who has completed Gregg simplified theory may also register in order to acquire shortened forms for higher speed dictation.

4-129. Gregg Shorthand I

Fall, 3 credits. Repeated in Spring and Summer

E. DONALD BELL
WILHELMINA M. CERINE
VINCENT B. VALLIERES
GERALD H. WICK

Theory of Gregg Shorthand Simplified. Beginning dictation on new and familiar material.

4-130. Gregg Shorthand II

Fall, 3 credits. Repeated in Spring and Summer

E. DONALD BELL
WILHELMINA M. CERINE
MARCELLA E. TROTTNOW
VINCENT B. VALLIERES

Increasing mastery of principles of Gregg Shorthand Simplified through review and drill. Minimum dictation speed of 60 words a minute attained, with accurate transcription on new standard material. *Prerequisite:* Gregg Shorthand I, or equivalent.

4-225. Gregg Shorthand III (60-80 Words)

Fall, 3 credits. Repeated in Spring and Summer

E. DONALD BELL
WILHELMINA M. CERINE
EVELYN J. ROBSON
VINCENT B. VALLIERES

Review of theory. Brief forms, word beginnings and endings. Preliminary phrasing. Extensive dictation practice, using general business and governmental material. In-class and outside transcription. Sample Civil Service test material. Maximum dictation speed of 80 words a minute attained. *Prerequisite:* Gregg Shorthand I and II, or equivalent, and minimum speed of 60 words a minute on new standard material.

4-226. Gregg Shorthand IV (80-100 Words)

Fall, 3 credits. Repeated in Spring

NORA M. WALKER

For the shorthand writer of any system with dictation speed of 80 words a minute and ability to transcribe letters and reports accurately.

4-227. Gregg Shorthand V (100-120 Words)

Spring, 3 credits. Repeated in Summer

FRANCES A. BUTLER

For the shorthand writer of any system with dictation speed of 100 words a minute. Civil Service procedure tests and Gregg awards.

Physical Sciences

DEPARTMENTAL COMMITTEE

Henry Stevens, *Chairman*

Bernard H. Armbricht, William E. Benson, Albert V. Carlin, Bowen C. Dees, John Harms, Joseph Hilsenrath, John Lyman (*vice-chairman*), John G. Manning, Paul W. McDaniel, Alfred Weissler

Professional and cultural courses in this department afford unusual opportunity for study under guidance of practicing scientists. Unless specifically stated, there is no laboratory work.

General

5-225. Principles of Physical Science

Year, 2 credits each semester

MICHAEL J. PALLANSCH

Survey course for those working with scientific materials but without scientific training. Especially for editors, information specialists, librarians, research assistants, and others with general interest in current developments in physical sciences. Relationships of concepts held in common in chemistry, cosmology, medicine, and physics to recent developments in antibiotics, atomic power, human nutrition, space travel, synthetic fibers, and other subjects of current interest. A student may register for the second semester without the first.

5-437. History of Science in United States

Spring, 2 credits

WYNDHAM D. MILES

Development of science in United States from colonial times to present. Trends in science education, science societies, and science publications. Development of science in government. Rise of industries based on science. Lives and contributions of significant American scientists.

5-442. Development of Modern Science

Fall, 2 credits

NATHAN REINGOLD

Survey of growth of knowledge in biological and physical sciences. Principal emphasis on emergence of basic concepts, patterns of research, and scientific profession with specific institutions. Relation of these to development of applied research, changes in intellectual climate, and other consequences of scientific advance.

5-175. Descriptive Astronomy

Year, 2 credits each semester

BENNY L. KLOCK

Designed to give both layman and amateur astronomer better understanding of astronomy. Neighbors of solar system, such as moon, planets, comets, and meteors. Galaxy and associated interstellar phenomena. Basic principles of telescopes and spectroscopy. Nontechnical introduction of fundamental physical laws. *Prerequisite:* High school algebra. A student may register for the second semester without the first.

5-349. Advanced Space Science

Fall, 2 credits

FRED SCHULMAN
DOUGLAS L. WOLF

Lectures in space sciences. Application of rockets to study of earth and other planetary atmospheres and ionospheres, including origin, composition, structure, and dynamics. Nature and characteristics of energetic particles in space, including galactic cosmic radiation, trapped radiation (Van Allen type), solar flares, and particles. Effects of these charged particles on geophysics of earth (sun-earth relationships). Theories explaining mechanisms by which particles are accelerated. Origin, nature, and theory of magnetic fields and use of space probes and satellites in their measurements and characterization. Description of United States and Soviet lunar sciences and astronomical programs. Effects of space environment on biological systems. Program for search of extraterrestrial life. *Course not concerned with technology of launching vehicles or manned space flight.* *Prerequisites:* College level courses in calculus and physics.

5-441. Technology of Modern Food Processing

Spring, 2 credits

LOWRIE M. BEACHAM

Basic principles and techniques employed in various methods of food preservation. Older techniques of drying, pickling, canning, freezing, and newer advances in dehydrofreezing, freeze-drying, use of ionizing radiations, and the like. Historical review of fundamental research making modern food processing possible. Use of preservatives and other currently permitted food additives. Applicable provisions of Federal Food, Drug, and Cosmetic Act dealing with foregoing and other aspects of food manufacture and distribution. Identity, quality, grade standards, and objective methods of evaluating various factors used therein. *Prerequisite:* Course in general chemistry at undergraduate level. Additional courses in organic chemistry and bacteriology recommended, but not required.

5-765. Practical Electronics for Biologists and Chemists

Year, 2 credits each semester

KARL H. NORRIS

PAUL E. WILKINS

First semester: Nonmathematical physical explanation of basic principles of electricity. AC and DC circuits. Passive electronic components. Vacuum tubes and transistors. Chemical and biological transducers. Practical information on measurements, trouble shooting, design, and limitation of instrumentation. Demonstrations on construction and application of hardware items. Second semester: Specific electronic instrumentation. Problems in spectrophotometry, spectroscopy (visible, IR, electron, and neutron), recording instruments, vacuum technology, feedback control systems, nuclear magnetic resonance, and the like. *Prerequisite:* Bachelor's degree.

Chemistry and Physics

5-100. General Chemistry

Year, 3 credits each semester

RICHARD H. JAQUITH

Designed to provide background in problems and practices of chemistry for workers in other professional fields and for subprofessionals in chemical work. Descriptive chemistry of commoner elements and consideration, at appropriate level, of atomic theory, periodic table of elements, valence, acid-base concepts, oxidation-reduction reactions, reaction rates and equilibria, pH, normality and molarity, and stoichiometry. Consideration of mathematical problems related to chemistry. *Prerequisite:* High school algebra.

5-248. Organic Chemistry

Year, 3 credits each semester

BENJAMIN H. ALEXANDER

Major emphasis on aliphatic and alicyclic chemistry. Also aromatic, heterocyclic, and carbohydrate chemistry. Consideration of complex alkaloids. Emphasis throughout on general principles. Use of electronic conceptions where pertinent. *Prerequisite:* General Chemistry, or equivalent.

5-249. Chemistry of Carbohydrates

Year, 3 credits each semester

WILEY W. TOLSON

Survey of field of carbohydrates, including sugars, derived products, and polysaccharides from organic, physical, analytical, biological, and industrial chemical aspects. *Prerequisites:* General Chemistry and/or Organic Chemistry, or equivalent.

5-315. Elementary Biochemistry

Year, 2 credits each semester

ALAN J. SHEPPARD

Comprehensive survey of chemistry of body constituents and metabolic conversion. First semester: Chemistry of carbohydrates, fats, proteins, and fundamentals of enzyme chemistry. Second semester: Digestion and absorption of food, intermediary metabolism, and the physiological role of vitamins and hormones. *Prerequisite*: Organic Chemistry.

5-317. Introduction to Modern Biochemistry

Fall, 3 credits. Repeated in Spring

LOUIS FEINSTEIN

Comprehensive survey of chemistry of plant and animal constituents and metabolic changes. Fundamentals of biochemistry, including study of carbohydrates, fats, proteins, foods, enzymes, vitamins, energy, and intermediary metabolism. *Prerequisite*: Organic Chemistry.

5-126. Modern Physics

Fall, 2 credits

AGDA ARTNA

Descriptive treatment of atomic and nuclear structures, radioactivity, elementary particles, and nuclear fission and fusion.

5-411. Biophysics

Fall, 3 credits

ALFRED WEISSLER

Descriptive survey of applications of physical and chemical principles to biological systems. Molecular basis of vision. Structure of viruses. Nerve conduction. Photosynthesis. Molecular and cellular effects of ionizing radiation. Thermodynamics of enzyme reactions. Ultrasonic effects. Molecular genetics. *Prerequisites*: College biology, chemistry, and physics.

5-413. Biophysical Instrumentation

Fall, 2 credits

WILLIAM J. CAMPBELL

Survey course designed to present techniques of physical measurement and control. Descriptive rather than analytical approach covering methods of measurement and control in use in industrial and physical laboratories. Expedient trail methods and improvisations applicable to research problems. *Prerequisite*: College physics, or equivalent.

5-418. Introduction to Gas Chromatography

Fall, 3 credits

LEO KAZYAK

Elementary course in fundamentals and techniques of chromatography. Detectors and detector sensitivity, effects of temperature, gas flow, and gas pressure and column preparation. Simple applications of gas chromatography to analysis of gases and volatile compounds. *Prerequisite*: General Chemistry, or equivalent.

5-419. Applications of Gas Chromatography—Seminar

Spring, 3 credits

LEO KAZYAK

Designed to acquaint the student with current developments in gas chromatographic applications. *Prerequisite*: Introduction to Gas Chromatography, or equivalent.

5-431. Principles of Fusion Power

Year, 3 credits each semester

H. HARRISON

Principles and techniques to achieve controlled fusion power. Kinetic theory of gases. Gaseous discharges. Motion of charged particles. Instrumentation methods. Experimental fusion machines. Applied mathematics. *Prerequisite*: Bachelor's degree in chemistry, engineering, or physics.

Geography and Geology

Courses in Meteorology, Oceanography, Soil Science, and Surveying and Mapping are closely related to this field.

2-114. Maps and Charts (See P. 27)

5-203. General Geology

Fall, 3 credits

RAYMOND C. DOUGLASS

Minerals and rocks as constituents of earth's crust. Processes of weathering, erosion, and deposition. Vulcanism. Structures of sedimentary and igneous rock formations. Diastrophism. Mountain building. Land forms and their relation to various geologic processes. Stability of earth's crust. Classroom exercises in study of common minerals and rocks and interpretation of topographic and geologic maps. *Prerequisite*: Inorganic chemistry desirable.

5-204. Historical Geology

Spring, 3 credits

RAYMOND C. DOUGLASS

Study of development of earth through time, growth and destruction of mountains, origin of sedimentary formations, and development of plants and animals from first meager evidences of life to present. Field and laboratory study of rocks and fossils of representative geologic ages exposed in greater Washington area. *Prerequisite*: General Geology, or acquaintance with principles and processes of physical geology.

8-208. Aerial Photographic Interpretation (See P. 90)

8-408. Advanced Aerial Photographic Interpretation (See P. 90)

5-553. Hydrology (1963-64 and alternate years)

Year, 3 credits each semester

TOR NORDENSON

Basic and applied hydrology at professional level. First semester: Elementary hydraulics. Measurement and interpretation of streamflow, precipitation, and other basic data. Hydrologic cycle. Physics of soil moisture. Infiltration theory. Wave travel and unit hydrograph. Second semester: Development and application of procedures for applying basic hydrology to practical problems of river forecasting and design of water control works, including streamflow routing, flood frequency, rational method of estimating flood magnitude, hydrometeorology, forecasting of runoff, influence of water control structures on streamflow, and problems of water control operation. *Prerequisites*: College algebra and physics. Elementary meteorology, statistics, and engineering desirable.

Soil Science

[5-405.] Soils: Their Nature and Geography (1964-65) and alternate years)

Spring, 3 credits

ROY W. SIMONSON

Nature and distribution of soils, especially in relation to other elements of natural environment. Discussion of nature and properties of soils with minimum of technical terms. Factors and processes of soil formation. Distribution of soils in broad regional patterns, with emphasis on United States. Consideration of reasons behind patterns. Local patterns of soil distribution and explanations for them, with examples from different regions. Significance of patterns of distribution to present uses and to potentialities of soils for various uses. *Prerequisite*: College Freshman chemistry, or equivalent. Previous training in physical geography, geology, or plant ecology desirable.

5-531. Soils: Their Morphology, Genesis, and Classification (1963-64 and alternate years)

Spring, 3 credits

ROY W. SIMONSON

Morphological characteristics of soils, mode of formation, and classification. Review of prevailing concepts of soils. Discussions on soil profile and its horizons, with illustrations from great soil groups of world. Consideration of steps and processes of soil formation in relation to morphology and composition of soils. Logic of classification and its application to soils, together with systems of soil classification. Frequent examples to indicate importance of understanding nature and origin of soils to effective utilization of soil resources. *Prerequisites:* College Freshman chemistry, or equivalent, and introductory soil science. Background in geology and some advanced chemistry desirable.

Meteorology

The following courses in meteorology are offered in cooperation with the United States Weather Bureau. They may be taken individually, or as a program leading to a certified statement of accomplishment. Registration is open to all qualified students.

CERTIFIED STATEMENTS OF ACCOMPLISHMENT IN METEOROLOGY

A Certified Statement of Accomplishment in Meteorology is granted to a student who has completed an organized program either on the elementary or on the advanced level.

ELEMENTARY CERTIFIED STATEMENT

Requirements

1. Required prerequisite courses:

Calculus

College Physics

Courses in differential equations and vector analysis are recommended for the student who plans to make meteorology his professional career. Courses in chemistry and statistics are also useful but not essential.

2. 19 semester hours of credit with a grade of C or better in each of the following courses:

General Meteorology (3)

Introduction to Dynamic Meteorology (6)

Synoptic Meteorology (6)

Weather Analysis and Forecasting (4)

ADVANCED CERTIFIED STATEMENT

Requirements

1. 34 semester hours of credit including all courses required for the Elementary Statement
2. Advanced Weather Analysis and Forecasting (6)
3. Electives (9 credits)
 - Agricultural Meteorology (3)
 - General Oceanography (2)
 - Applied Climatology (3)
 - Tropical Meteorology (3)
 - Literature of Meteorology (2)
 - Principles of Statistical Analysis (6)
 - Satellite Meteorology (3)

A student seeking either of these certified statements should consult with the Registrar and obtain approval of his proposed course of study early in his academic program. Equivalent courses will be accepted by transfer from other institutions. An applicant for either certified statement must file a transcript of his high school or college record before completion of his program.

5-326. General Meteorology

Spring, 3 credits

HUGO V. GOODYEAR

Fundamentals of physical aspects of modern meteorology for the professionally interested student. Atmospheric composition and structure and their measurements. Solar and terrestrial radiation and radiation laws. Gas laws. Adiabatic, pseudoadiabatic, and non-adiabatic processes. Fronts. Thunderstorms. Fog. Wind. *Prerequisites*: Two years of high school algebra and trigonometry

5-330. Agricultural Meteorology

Fall, 3 credits

DONALD P. SPRINGER

Application of meteorology and climatology to operational problems in agriculture. Micro-meteorology applied to agriculture. Heat and water budgets in plant zone of soil and atmosphere, elementary soil physics, and meteorology of enclosed spaces. Agricultural climatology and micro-climatology. Effects of weather on agricultural production, including economic and physical effects on plants, animals, insects, and plant diseases. Weather services for agriculture, including specialized synoptic forecasts, utilization of climatological data, and instrumentation for agricultural observations. *Prerequisite*: Introductory meteorology, or special permission.

5-415. Applied Climatology

Fall, 3 credits

HERBERT C. S. THOM

Discussion of statistical tools of climatological analysis needed for solution of applied problems. Solution of examples from agriculture, aviation, engineering, and specialized aspects of industry. The student works these problems as exercises.

5-534. Introduction to Dynamic Meteorology

Year, 3 credits each semester

DONALD L. JORGENSEN

Application of general principles of mechanics, thermodynamics, and fluid motions to study of the atmosphere and its movements. *Prerequisites*: College physics and mathematics through differential and integral calculus, or equivalent.

5-536. Synoptic Meteorology (1963-64 and alternate years)

Year, 3 credits each semester

JAY S. WINSTON

Description and explanation of circulation and weather processes observed in atmosphere, with emphasis on forecasting applications. First semester: Air motion, three-dimensional structure of pressure and wind systems, cyclones, anticyclones, front, air masses, and prognosis of circulation pattern. Second semester: Temperature forecasting, clouds and precipitation, fog and other visibility phenomena, thunderstorms, squall lines, tornadoes, turbulence, icing, sea breeze, and mountain and valley winds. *Prerequisites*: General Meteorology, college physics, and calculus, or special permission.

[5-538.] Weather Analysis and Forecasting (1964-65 and alternate years)

Year, 2 credits each semester

JAY S. WINSTON and CARLOS R. DUNN

Laboratory course in applying concepts of air masses, fronts, and midtropospheric flow patterns to analysis and prognosis of sea level and upper air weather charts for North America and adjacent areas. Preparation of short range forecasts of various weather elements for local and regional areas of United States, utilizing guidance material from National Meteorological Center. Special emphasis on proper use of numerical circulation prognoses. *Prerequisite*: Synoptic Meteorology, or equivalent. This course may be taken concurrently with Synoptic Meteorology.

5-580. Advanced Weather Analysis and Forecasting (1963-64 and alternate years)

Year, 3 credits each semester

JAY S. WINSTON and CARLOS R. DUNN

Treatment of many techniques and concepts important in present-day forecasting, including some more advanced developments. First semester: Hemispheric synoptic map analysis. Predicting motion and development of waves in westerlies. Numerical weather prediction. Large-scale vertical motion and divergence. Isentropic analysis. Jet stream. Second semester: Extended-range forecasting. Statistical prediction methods. Forecasting tornadoes and severe thunderstorms. Lectures and laboratory. *Prerequisites*: Dynamic Meteorology, Synoptic Meteorology, and Weather Analysis and Forecasting, or equivalent.

5-589. Tropical Meteorology

Fall, 3 credits

LESTER F. HUBERT

Lecture and laboratory course designed to present principles of tropical meteorology to the student with fairly good background in general meteorology. Discussion of synoptic and dynamic meteorology from point of view of examining modifications to theoretical and synoptic applications required by low latitude meteorology. Main emphasis on lectures. Convection. Dynamics and kinematics of tropics. Synoptic models. Hurricane structure. Methods of hurricane forecasting. Minor laboratory work introducing the student to analysis methods for low latitudes. Emphasis on isogon-isotach (streamline) analysis. *Prerequisites*: 20 hours of meteorology including introductory course in dynamics or hydrodynamics, or equivalent in experience. Calculus desirable.

5-590. Literature of Meteorology

Spring, 2 credits

JOHN SHERROD

Designed to provide knowledge of meteorological literature and methods for using it. Analysis of sources of meteorological information. Description and classification of important journals, books, and other published and non-published materials. Methods of searching meteorological literature. *Prerequisites*: Professional training and, or experience in meteorology, or special permission.

5-595. Satellite Meteorology

Fall, 3 credits

SIGMUND FRITZ, JAY S. WINSTON, LESTER F. HUBERT, and ASSOCIATES

Literal expansion of horizons of meteorology by meteorological satellites through producing on global scale comprehensive pictures of cloud systems, measurements of heat budget of earth, and other important meteorological observations. Designed to acquaint meteorologists with types of data obtainable from satellites. Methods of processing data for convenient meteorological use. Interpretation and use of picture and radiation data for synoptic research and forecasting. Physical interpretation of radiation data. Application of radiation data to studies of planetary heat budget and general circulation. Advanced instrumentation and new experiments on future satellites. National and international aspects of operational meteorological satellite program. Lecture course, with some illustrative laboratory work for each student. Solution of typical space-geometry problems involved in television picture rectification and infrared sensor data location. Interpretation of pictures in terms of meteorological parameters. Analysis of infrared radiation data and its use in determining cloud-top height and surface temperature. *Prerequisites*: Dynamic and synoptic meteorology, calculus, and college physics, or special permission.

Oceanography

The following courses in oceanography are offered in cooperation with the United States Naval Oceanographic Office. They may be taken individually, or as a program leading to a certified statement of accomplishment. Registration is open to all qualified students.

CERTIFIED STATEMENT OF ACCOMPLISHMENT IN OCEANOGRAPHY

A Certified Statement of Accomplishment in Oceanography is granted to a student who has completed an organized program of courses in the field.

Requirements

1. 20 semester hours of credit with a grade of C or better in each of the following courses:
 - a. Required courses (6 credits)
 - Physical Properties of Sea Water (2)
 - Geological Oceanography (2)
 - Biological Oceanography (2)
 - b. Electives (8 credits)
 - Principles of Underwater Sound (2)
 - Applied Underwater Sound (2)
 - Practical Electronics for Oceanographers (2)
 - Ocean Surface Waves (2)
 - Marine Meteorology (2)
 - Dynamic Oceanography (2)
 - c. 6 semester hours of credit in fields related to oceanography, including biology, chemistry, engineering, geography, geology, mathematics, and meteorology.

A student seeking this certified statement should consult with the Registrar and obtain approval of his proposed course of study early in his academic program. Equivalent courses will be accepted by transfer from other institutions. An applicant for this certified statement must file a transcript of his high school or college record before completion of his program.

5-360. General Oceanography

Fall, 2 credits

ROBERT E. BURNS

Characteristics of oceans and factors that control distribution of properties and of plants and animals. Biology, chemistry, geology and physics of the oceans. *Prerequisite*: College courses in at least two of the physical or biological sciences.

5-475. Principles of Underwater Sound

Fall, 2 credits

MORRIS SCHULKIN

Fundamental principles of acoustics and application of these principles to underwater sound. Transmission of sound in the sea, including refraction, reflection, scattering, attenuation, and fluctuation. *Prerequisites*: Calculus and college physics.

5-476. Applied Underwater Sound

Spring, 2 credits

MORRIS SCHULKIN

Applied theory and practice for those entering the field or working in related fields. Ray theory, normal mode theory, sound channels, noise and reverberation, measurement techniques, and elements of transducer design. *Prerequisite*: Principles of Underwater Sound, or equivalent.

[5-584.] Physical Properties of Sea Water (1964-65 and alternate years)

Spring, 2 credits

ROBERT E. BURNS

Examination of physical principles governing properties of sea water. Comparison of these properties with those of pure water. Definition and calculation of salinity and density. Distribution of salinity, temperature, and density.

5-585. Practical Electronics for Oceanographers (1963-64 *and alternate years*)

Spring, 2 credits

S. O. BAILEY

Basic principles of electronic theory and elementary circuitry. Demonstration of composition of various instrument components, with emphasis on methods of combining components for specific instrumentation. Practical demonstrations and laboratory work.

[5-655.] Ocean Surface Waves (1964-65 *and alternate years*)

Spring, 2 credits

J. J. SCHULE, JR.

Measurable properties of ocean surface waves and the methods of observing and analyzing ocean waves. Demonstration of wave solution to hydrodynamic equations. Discussion of various sea surface models including their assumptions, solutions, and practical applications. Problems of propagation of waves in dispersive medium. Examples of various forecasting techniques. *Prerequisite*: Calculus, or Mathematics for Oceanographers.

[5-658.] Geological Oceanography (1964-65 *and alternate years*)

Fall, 2 credits

JOSHUA I. TRACEY, JR.

Topography, composition, processes of sedimentation, and geologic history of ocean basins, continental shelves, and coastal features. *Prerequisite*: Professional knowledge of geology or oceanography.

5-662. Marine Meteorology (1963-64 *and alternate years*)

Fall, 2 credits

M. D. BURKHART

Introduction to fundamental principles of marine meteorology with special emphasis upon problems of marine climatologist and physical oceanographer. Descriptive and synoptic meteorology. Air mass analysis. Boundary processes. Radiation. Climatic principles. *Prerequisite*: Professional knowledge of meteorology or oceanography.

5-664. Dynamic Oceanography (1963-64 *and alternate years*)

Fall, 2 credits

J. J. SCHULE, JR.

Introduction to principles of vector analysis. Development of principles of conservation of mass and momentum. Vector equations of motion. Hydrostatic equations and density-pressure-depth relationship. Various current equations. Principles of turbulence. Equation of mean motion. Various approaches to problem of evaluating eddy stress terms. *Prerequisite*: Physical Properties of Sea Water or equivalent.

[5-666.] Biological Oceanography (1964-65 *and alternate years*)

Fall, 2 credits

SAMUEL A. ARNY

Detailed examination of marine ecosystem, stressing community relationships and influence of the physicochemical environment on marine life. Distribution of flora and fauna.

Public Administration

DEPARTMENTAL COMMITTEE

John H. Thurston, *Chairman*

Gladys L. Baker, Tony M. Baldauf, K. A. Butler, John C. Cooper, Jr., Erwin R. Draheim, Thomas J. Flavin, Warner H. Hord, Clare Hendee, Henry G. Herrell, G. E. Hilbert, Dorothy H. Jacobson, Martin Kriesberg, William A. Minor, Ross Pollock, Max P. Reid, John L. Wells (*Vice-chairman*)

Public administration deals with the processes of operating government. As the Federal Government has become larger and more complicated, it has become more important to study and understand these processes in order to achieve effective administration of public programs. The processes of administration include general administration and management, personnel administration, budgeting, accounting and other aspects of financial administration, procurement and property management, and legal administration.

The Department of Public Administration offers courses in all these areas as well as in American national government and American history.

CERTIFIED STATEMENTS OF ACCOMPLISHMENT IN PUBLIC ADMINISTRATION

COMMITTEE

Gladys L. Baker, *Chairman*

Martin Kriesberg, John H. Thurston

Certified Statements of Accomplishment in Public Administration are granted to the undergraduate and advanced student who complete organized courses of study in public administration intended to provide basic training for responsible administrative work.

Certified Statement of Accomplishment—Undergraduate

The program leading to the Undergraduate Certified Statement of Accomplishment in Public Administration should be of special interest to the administrative assistant who wishes to prepare for a more responsible administrative position. The opportunity to take advanced and specialized courses should be equally attractive to the Management Intern who enters the Federal Service with a management option. The students who enter with other professional options can also profit greatly from these courses if they wish to prepare to enter upon administrative work connected with their professional fields. This program is useful for the student in a non-administrative specialty who expects to take on administrative duties, or who wishes to enter administrative work. The student in a technical field can also find opportunity from this program to broaden his understanding of Government administration. Graduation from high school, or the equivalent, is the minimal educational background required.

Requirements (44 credits)

1. 20 semester hours of credit with a grade of C or better in college level courses in the Social Sciences.

Required courses:

American or European Government, or Political Science

Principles of Economics

American or European History

Introduction to Public Administration

These requirements may not be waived, but equivalent courses may be accepted by transfer from other institutions. With the approval of the Registrar, credit may also be given for 6 semester hours of tool courses relating to work in public administration. These may be in accounting, economics, statistics, writing, or a subject-matter area concerned with the work of the department or agency in which the student is employed.

2. 24 semester hours of credit with a grade of C or better in courses in public administration, excluding all accounting courses except Internal Auditing. These are to be distributed, as follows:
 - a. 6 credits from Management Analysis
 - b. 18 credits from General Administration, Financial and Budgetary Administration, Legal Administration, Personnel Administration, Procurement and Property, or additional courses in Management Analysis. The student is advised to include in his program at least one course from each area.
 - c. Credit may be given for courses other than those in public administration with the approval of the Registrar. These courses should be compatible with the major interest of the student. Not more than two courses may be from Office Techniques and Operations.

A student seeking this certified statement should consult with the Registrar and obtain approval of his proposed course of study early in his academic program. When the student has completed the requirements in the social sciences and 15 semester hours in public administration, he should review his course of study with the Registrar. Equivalent courses will be accepted by transfer from other institutions.

Certified Statement of Accomplishment in Management—Advanced

The program leading to the Advanced Certified Statement of Accomplishment in Management offers an organized course of study intended to provide advanced training in management. The program should be of interest to the student who is responsible for management of operating programs as well as to those in specialized fields of management who wish to add perspective to their work. The program is also designed for the student who wishes to prepare for a more responsible administrative position and for those in scientific, technical and professional work who have or expect to have administrative responsibilities. The requirements are designed to assure broad coverage in the major areas of administration.

Requirements (20 credits)

1. An undergraduate degree, an Undergraduate Certified Statement of Accomplishment in Public Administration, or Government experience at the GS-9 level, or above.
2. 20 semester hours of credit with a grade of B or better, as follows:
 - a. 15 credits from the following:
 - Budgetary and Financial Administration (2)
 - Employee Training and Development (3)
 - Executive Staffwork (3)

Human Relations in Administration (3)
 Management—Seminar (3)
 Modern Supervisory Practice (2)
 Principles and Practices of Management (2)
 Readings in Public Administration (3)
 Techniques of Organization (3)

- b. Remaining credits selected from courses numbered 500 or above in public administration or, with the approval of the Registrar, in other social sciences.

A student seeking this certified statement should consult with the Registrar and obtain approval of his proposed course of study early in his academic program. When the student has completed 12 credits in public administration, he should advise the Registrar so that he may be assigned to an advisor. Equivalent courses will be accepted by transfer from other institutions. An applicant for either certified statement must file a transcript of his high school or college record before completion of his program.

The student who has completed the requirements for the Undergraduate or Advanced Certified Statement of Accomplishment in Public Administration with an average grade of B or better may qualify for honors by passing an oral examination. The examination is given by a panel set up by the Graduate School. The student who wishes to take an oral examination should apply to the Registrar at the completion of his program.

General Administration

COMMITTEE

Martin Kriesberg, *Chairman*

Gladys L. Baker, Jack Koteen, A. J. Nichols

These courses offer general understanding of American Government and administrative processes and provide a foundation for more specialized work in management and public administration. A student who plans to take courses in any of the specialized fields of administration will find that his work will be more meaningful and useful if he has first completed some of the background and basic courses listed here.

6-341. American National Government

Fall, 3 credits. Repeated in Spring

SALVATORE NERBOSO

History and origins of national Government of the United States. Political process: Parties and elections. Legislative process. Functions of national Government and their administration. Courts and judicial review of legislation.

6-515. Legislative Process

Fall, 2 credits

CARL R. SAPP

Legislative process in Federal Government. Emphasis on substantive aspects of executive-legislative relationships. Organization of Congress. Consideration of bills in committee and on floor. Legislative functions of the President. Assistance by executive agencies in legislative process. Informal relationships between legislative and executive branches. Congressional investigations of executive agencies. Legislative controls over administration. Influence of party leadership and special interest groups. Legislative aids. Proposals to improve legislative process. Informal discussion, visual aids, and lectures by recognized specialists. *Prerequisite*: American National Government, or equivalent.

4-201. Modern Supervisory Practice (See P. 45)

4-202. Management—Seminar (See P. 45)

6-344. Introduction to Public Administration

Fall, 2 credits

ALFRED J. DAVIDSON

Designed to introduce the student to elements of public administration and to lay the foundation for further study and practice in this field. Nature and scope. Management of public affairs. Contrasts and similarities in public and private management. Mechanisms and procedures for carrying out public function. Relationships of branches of government in United States.

6-347. Principles and Practice of Management

Fall, 2 credits

EDWARD F. WILSON

Knowledge and managerial responsibilities that distinguish professional managers from other professional personnel, in terms of both theory and application. Principles of planning, organizing, directing and controlling, and their application as encountered in public administration. Development and discussion of ways by which these management principles can be used by class participants in executing their supervisory responsibilities. *Prerequisite:* Supervisory work experience at Grade GS-9 or above, or special permission.

6-400. Administrative Operations for Congressional Assistants

Spring, 2 credits

JEROME N. ELLER

Practical administrative problems encountered by secretaries and other staff assistants to United States Senators and Congressmen. Organization of office routine. Preparation and distribution of newsletters and publicity releases. Special services available to members of Congress. Use of Senate and House Documents and reports. Relations with the Executive departments. Pressure groups. Relations with constituents. Practical workings of Congress. Assistance with legislative matters.

6-453. Human Relations in Administration

Fall, 3 credits

JAMES M. ENNEIS
ARTHUR R. LANEY, JR.

Designed to develop understanding of and insight into inter-personal relationships in large-scale organizations. Value orientations in administration. Formal and informal organization. Pathologies in administration. Status and role. Power and authority. Styles of leadership. Authoritarian and democratic administrators. Career dynamics. Psychological stress in administration. Motivation and morale.

6-454. Applied Human Relations in Administration

Spring, 3 credits

JAMES M. ENNEIS

Practice in applying principles of human relations in administration. Diagnoses of social processes in administration. Skills of effective performance in face-to-face situations. Formulation and assignment of administrative objectives. Creation of appropriate social climate. Leadership skills. Utilization of member resources. Irrational factors in administration. Decision-making processes. *Prerequisite:* Human Relations in Administration, or special permission.

6-459. Executive Staffwork

Fall, 3 credits

ALVIN J. HURTT

To help staff personnel formulate and use personal philosophy and systematic approach in solution of major managerial problems. For staff specialists and chiefs of staff offices. Appropriate for all staff specialties: Budget and accounting, management services, personnel, planning, supply, and others. Concept of "completed staff work." Formulation of philosophy and system for new dimension in staff work. Emphasis on visual tools, consultative management, and innovation. Prac-

tice and critique in preparing and making presentations on selected management problem from work situation of student. Step-by-step methods illustrated by graphic materials used in evolving manpower planning and career development program in large Federal agency.

6-735. Comparative Administration in Its Political and Social Environment

Spring, 3 credits

ALFRED J. DAVIDSON and JACK KOTEEN

Introduction to political and social environment of administration in emerging countries. Designed to increase understanding and awareness of difficulties that hinder or preclude transfer of modernizing administrative technology to emerging nations. Topics included: Sources and use of political power. Functions of political development. Power "elites," their viewpoints and values. Social and cultural barriers to change. Characteristics of traditional societies in transition and their impact on administrative institutions. Exploration of the bureaucratic tendencies of emerging nations. Efforts to improve personnel and merit systems. Movements of decentralization and rural development. Managerial and supervisory systems and practices. Training of foreign participants. Participation in small group country case study required. Guest speakers. Seminar methods.

6-600. Readings in Public Administration

Fall, 3 credits. Repeated in Spring

JOHN H. THURSTON, Coordinator

Supervised readings with monthly conferences on specified topics of administration or individual research and a paper on some problem or phase of administration, under the guidance of a senior administrative official. Readings or problem to be investigated determined in consultation with adviser. *Prerequisite*: Completion of all other requirements for Undergraduate or Graduate Certified Statement of Accomplishment in Public Administration, or by special permission with equivalent background in public administration.

American History

6-250. American History to 1865

Fall, 3 credits

WAYNE D. RASMUSSEN

Political, social, economic, and cultural forces prior to 1865, contributing to development of American civilization. Summary of colonial period. Political, economic, and diplomatic factors of American Revolution. Development of national life and institutions.

6-251. American History since 1865

Spring, 3 credits

WAYNE D. RASMUSSEN

Political, social, economic, and cultural forces since 1865, contributing to development of present-day American civilization. Frontier movement and immigration. Constitutional growth and changes in world relations. Economic change and development.

Management Analysis

COMMITTEE

John C. Cooper, Jr., *Chairman*

N. Robert Bear, Edmund D. Dwyer, Arthur B. Jebens, Mark M. Kirkham, Gordon D. Osborn, Harold A. Stone, James H. Stover

Management analysts in Federal agencies serve as staff assistants to management officials for the purpose of improving the efficiency and effectiveness of the organiza-

tion served. The paramount characteristic is ability to solve a wide variety of management problems through analytical ability of a high order and extensive practical and theoretical knowledge of management functions and techniques. Understanding of the management process is essential, as well as skill in the techniques used to gather and analyze data and develop appropriate policies, procedures, and control systems applicable in handling operating problems.

The courses outlined below offer basic training in the general field and in special areas.

6-406. Principles of Management

Fall, 2 credits. Repeated in Spring

WALDEN COGGESHALL
WILLIAM F. RAPP

Basic course covering nature of modern management and principles and best practices involved in management process. Subject matter studied in terms of basic functions in management: Planning, organizing, directing, coordinating, and controlling. Use of case materials. This course is offered when there is demand from individual students or a Federal department or agency on a contract basis.

6-405. Principles and Techniques of Management Analysis

Fall, 2 credits

JOHN H. FINLATOR
BRUCE C. PRICE

General survey of principles and techniques applicable in organization and management of Federal agencies. Emphasis on role of management analyst in assisting responsible officials to plan organization structure, to conduct management surveys, to establish administrative goals, and to simplify work methods. Discussions of qualifications needed for management analysis work and relationship of this function to other agency activities. Designed to familiarize the student with basic substantive knowledge essential in the field of management analysis. *Prerequisite*: Experience in management analysis, or special permission.

6-407. Staff Function of Management Analysis

Spring, 2 credits

RICHARD F. COOK

Study of management problems and their solution through staff units engaged in management analysis. Trends in modern management, stimulation of improvements in agency operation, relation of delegation of authority to organization, headquarters and field relationships, and role of staff units in establishment of management controls and evaluation of results. From perspective of top management, the student undertakes comprehensive study of elements of management analysis essential to an effective staff function. *Prerequisite*: Principles and Techniques of Management Analysis, or special permission.

6-409. Conduct of Management Surveys

Spring, 2 credits

JOHN H. FINLATOR
WILLIAM S. DINSMORE

Methods useful in management surveys, with emphasis on techniques required in fact-finding, logic necessary in analysis, and "selling" required in presentation of recommended solutions for identified problems. Study of comprehensive management survey including, but not limited to, reconnaissance, organization, functional, procedural, and special purpose surveys, survey workshops, and case studies. Designed to give journeyman analyst opportunity for advancement in field of management analysis. *Prerequisite*: Experience in management surveys, or special permission.

6-410. Management of Directives Systems

Fall, 2 credits

CHARLES E. WYLIE

Review of basic systems of instruction- and order-communication in an agency. Emphasis on developing, installing, and operating agency directives management system. Study and case-work on

theory and practices encountered in running a directives management shop. Relationships with other staff services and systems. Types and uses of directives. Numbering and reference systems. Processing directives from planning to approval. Preparation of masters. Reproduction and distribution. Transmittal and maintenance control systems. Designed for personnel with staff or coordinating responsibilities, including directives management activities. Also for those in charge of directives management operation or working in some major phase of directives management operation, who wish to broaden their knowledge and effectiveness.

6-412. Reports and Forms Management

Fall, 2 credits. Repeated in Spring

WILLIAM B. RICE and ROBERT H. MEEHAN

Designed to acquaint the student with management significance of reports and forms. Role of paperwork in general and reports and forms in particular in modern administration. Potential for management improvement and economy through better reports and forms. Emphasis on improving contribution of documents to systems and procedures they serve. How to install, operate, and appraise reports and/or forms management.

6-519. Work Standards and Work Measurement

Fall, 2 credits. Repeated in Spring

SIDNEY SCHNEIDER

Advanced techniques of scientific management concerned with development of work standards and measurement of work loads and performance, and of their adaptability in public administration. Statistical and experimental methods of determining standards. Dangers to avoid in setting standards. Time study. Standards as dynamic part of operations and tool in developing policies on personnel placement and training. Standards as aids in developing budgets, in planning operations, and in individual work planning. Relationship of standards of performance to those of costs and quality. Importance of dependable standards, measurement, and appraisal of performance to summary statements of progress for the use of higher administrative officials. *Prerequisite*: Practical working experience at Grade GS-7 or above, or special permission.

6-550. Techniques of Organization

Spring, 3 credits

INSTRUCTOR TO BE ANNOUNCED

Organization of public and private agencies. Brief historical review of organization, including church, military, and modern industry. Division of work. Delegation of responsibility. Span of control and unity of command. Staff assistant and staff specialist. Group decision-making. Decentralization and the problems of coordination with geographical dispersion. Process of reorganization, including timing, development, and implementation. Organization chart and manual. Case studies. *Prerequisite*: Course in public administration, scientific management, or management analysis.

6-740. Dynamics of Organization—Seminar

Fall, 2 credits

JOHN H. FINLATOR

Theory and practice of organization. Designed to assist managers and top supervisors in assessing why their organizations are never constant. Exploration of ever changing dynamics of modern organization. Growth of organization theory. Complexity of organization. Behavioral influence of man-groups and institutions on organization. Organization of future. Case histories on organization structure, conflicts in organization, and motivation. *Prerequisites*: Practical working experience in organization of management responsibilities at Grade GS-12, or above, or bachelor's degree in public administration, or one of following courses—Human Relations in Administration, Applied Human Relations in Administration, Techniques of Organization, or special permission.

3-523. Introduction to Linear Programming (See P. 38)

3-533. Introduction to Operations Research (See P. 38)

Budgetary and Financial Administration

COMMITTEE

John L. Wells, *Chairman*

Charles L. Grant, Frank H. Spencer, Carl W. Tiller

These courses offer opportunities for the advanced student who has an interest in the basic substance and public policy aspects of financial and budgetary administration. These courses should be especially helpful to management-supervisory personnel having responsibilities in this area of administration. Those with limited experience in the field, or who are engaged in the procedural phases of budget formulation and execution, should begin their study with courses in Federal Budgetary Procedure and Federal Fiscal Procedure in the Department of Office Techniques and Operations.

4-112. Federal Fiscal Procedure (See P. 46)

4-116. Federal Budgetary Procedure: Formulation and Presentation (See P. 46)

4-118. Federal Budgetary Procedure: Execution and Fund Control (See P. 47)

6-525. Federal Financial System (1963-64 and alternate years)

Fall, 2 credits

CARL W. TILLER

Summary presentation of Federal fiscal administration, primarily on lecture basis. Review of policies, principles, and practices followed. Roles of major participants: the Congress, the President, the Department of the Treasury, the General Accounting Office, the Bureau of the Budget, and the operating departments. Designed to provide orientation to the Federal financial system, its organization and procedure, and recent trends in improvement of financial management. *Prerequisite*: Bachelor's degree, experience at Grade GS-7 or above in financial administration, or at Grade GS-9 or above otherwise, or special permission.

6-635. Budgetary and Financial Administration

Fall, 2 credits

CARL W. TILLER and ASSOCIATES

For experienced budget and administrative personnel. Covers broad phases of budgetary and financial administration in the Federal Government, primarily from the point of view of operating departments. Emphasis on role of budgeting in executive-legislative relationships. Importance of budgeting, accounting, auditing, financial reporting, and other aspects of financial administration to effective over-all management of an agency. *Prerequisite*: Bachelor's degree and introductory course in public administration, or experience at Grade GS-7 and above in financial or general administration, or special permission.

Personnel Administration

COMMITTEE

Max P. Reid, *Chairman*

Roy Colbert, Jack H. Foster, C. O. Henderson (*Vice-chairman*), Henry F. Hubbard, Harold H. Leich, James C. O'Brien, Ross Pollock, John A. Watts, Arnold S. Zander

These courses should be of concern to the Federal employee who is interested in a career in management. Some knowledge of the principles of public administration, such as can be acquired from the introductory course in public administration, is helpful although not required. It is also desirable that the general course, Public Personnel Administration, be taken before the specialized courses such as Position Classification, Employment and Placement, and the like. The student who is in a position classified at Grade GS-5 or below and who desires to prepare for personnel work should first take the course in Federal Personnel Procedure in the Department of Office Techniques and Operations. The interested student should not attempt to take any specialized courses until he has gained substantial experience in personnel work or has completed all the basic general courses.

4-201. Modern Supervisory Practice (See P. 45)

4-114. Federal Personnel Procedure (See P. 45)

6-430. Public Personnel Administration

Fall, 3 credits. Repeated in Spring

NEWELL B. TERRY

Designed for the supervisor and administrator who wish to have general familiarity with personnel work, for those in junior personnel staff positions desiring to broaden their understanding of personnel administration, and for those desiring to enter the field who need a foundation for more specialized courses in the personnel field. Primary emphasis on theory and practice of personnel administration in the Federal Government. Development and significance of personnel administration in public service. Recruitment, examination, and selection. Classification and pay concepts. Employee organizations, motivations, and training. Conduct and discipline. Role of Civil Service Commission, operating agencies, and their personnel officers. Personnel responsibilities of supervisors. Trends in personnel administration.

6-305. Safety Program Administration

Fall, 2 credits

THOMAS J. CRESSWELL and WILLIAM C. POPE

Designed for employment, training, property management, and general administrative personnel in Government and industry, responsible for, or engaged in, safety program management. Nature of safety program and value for management. Answers to practical safety management problems in large and small organizations. Consideration of nontechnical aspects of safety program management, including purpose, philosophy, and objectives. Authority, policy, and functional relationships. Required elements. Accident information management. Translation of duties of safety inspector and engineer for nontechnical safety program administrator.

6-315. Labor Management Relations in Civil Service—Seminar

Fall, 2 credits

JOHN G. GREGG and WILSON R. HART

Background of American labor movement. Development of existing body of labor law, providing framework of United States system of collective bargaining. Applicability of collective bargaining and its various essential elements to labor management relations in public employment, particularly in Federal service. Paper and oral presentation required of each student.

6-444. Position Classification

Fall, 2 credits. Repeated in Spring

WILLIAM C. LAXTON and JOSEPH P. FINDLAY

Fundamental concept of position classification and its uses. Relation of classification to compensation and other phases of personnel management. Analysis of Classification Act of 1949. Identification, analysis and application to specific positions of factors determining class and grade level. Job evaluation techniques. Application of position classification in Federal service including operating policies, practices, and procedures. *Prerequisite*: Introduction to Public Administration, or Public Personnel Administration, or Grade GS-4 or above in personnel work, or 60 semester hours of college work.

6-512. Employment and Placement

Fall, 3 credits. Repeated in Spring

JOHN R. GARNETT

Basic factors in employment market. Qualification standards, promotion, and other in-service placement programs. College recruitment, and other planned intake programs. Examination, selection, and utilization principles and practices for professional and administrative jobs. Career planning. Class discussion determined by specific student interests.

6-514. Interviewing Workshop

Fall, 2 credits

JOHN R. GARNETT

Directed at bettering skills of employment, placement, classification, employee relations, and other personnel, as well as administrative and operating personnel whose duties involve interviewing. Lecture, discussion, and text on cultural concepts, principles of psychology, and techniques and methods. Participation and observation in role-playing case studies. *Prerequisite*: Course in personnel administration, or current employment in position involving considerable interviewing.

6-518. Employee Training and Development

Fall, 3 credits. Repeated in Spring

JAMES G. STOCKARD

Development of human resources of an organization. Informal presentation of ideas for determining actual training needs and for organizing, staffing, financing, selling, evaluating, and recording training activity. Explanation of benefits of the Government Employees Training Act (Public Law 85-507). Interpretation of training implications of manpower picture for the 1960s. Demonstration of training methods and devices meeting test of successful programs in Government and industry. For personnel technicians, budget analysts, methods analysts, and supervisors. Orientation for foreign technicians, teachers, and others whose work requires appreciation of adult training and education methods of modern business world.

6-453. Human Relations in Administration (See P. 62)

6-454. Applied Human Relations in Administration (See P. 62)

Legal Administration

COMMITTEE

Thomas J. Flavin, *Chairman*

Ralph F. Koebel, David Reich, Ashley Sellers

6-320. Administrative Law and Procedure

Fall, 2 credits

THOMAS J. FLAVIN

Principles and practice of administrative law in the Federal field with concentration upon provisions of Administrative Procedure Act (1946) dealing with formal rule-making and adjudication and involving notice, hearing, evidence, findings, and control by the courts.

6-422. Business Law

Year, 2 credits each semester

HERBERT L. PERLMAN

Aspects of law essential to conduct of modern business. Forms of business organization, bailments, property, sales, mortgages, negotiable instruments, and contracts. The student may attend either or both semesters. No subject matter repeated.

6-425. Legal Aspects of Investigation—Criminal Evidence and Procedure

Spring, 2 credits

RALPH F. KOEBEL

Designed to provide investigative personnel and those desiring to prepare for such work, background and insight into legal aspects of their investigations. Types of evidence to seek. Circumstances and conditions under which the evidence is to be obtained in order to have adequate probative value. How to prepare such evidence for presentation in court or for other procedure. Designed to provide understandable information without overemphasis of technical aspects. *Prerequisite:* Sufficient educational background for appointment to training position in investigational work.

6-427. Aviation Law

Fall, 2 credits

DENIS A. COOPER

Principles and practice of aviation law with concentration upon provisions of Federal Aviation Act of 1958. Special emphasis on rules of law governing ownership, operation, and use of aircraft, including provisions relating to formal rule-making and adjudication procedures of Federal Aviation Agency and Civil Aeronautics Board involving notice, hearing, evidence, findings, and judicial review authority.

2-145. Law Librarianship

(See P. 27)

Procurement and Property Management

COMMITTEE

Tony M. Baldauf, *Chairman*

George D. Ferrare, Kelly T. McCracken, T. Alfred Pilson, N. O. Wood, Jr.

These courses examine the ways in which the Federal Government purchases, manages, and accounts for materials and supplies. The student interested in purchasing but with limited experience in such work will find it helpful to start with the courses in Federal Property Procedure and Federal Purchasing Procedure in the Department of Office Techniques and Operations. Selected background courses in public administration together with courses in the Division of Management Analysis offer thorough training in administration in this area.

4-113. Federal Property Procedure

(See P. 46)

4-115. Federal Purchasing Procedure

(See P. 46)

6-364. Federal Contracting

Spring, 2 credits

V. SAMUEL GUNTHER

Primarily for employees of civilian agencies using Federal procurement regulations. Contracting as technique of purchasing where advertising is required, including study of legal and administrative policy background of contract provisions, requirements of advertising, analysis of bids, contract award and administration, handling of disputes, appeals, protests, change orders, amendments, construction contract procedures, debarment procedures, and related subjects. Practical application by preparation of bids, contracts, orders, and related matters. *Prerequisite*: Federal Purchasing Procedure, or currently working in purchasing or contracting.

6-370. Government Construction Contracts

Fall, 2 credits

HAROLD F. BLASKY, PAUL H. GANTT, and HENRY B. KEISER

Government contract law, with special emphasis on construction contracts. Principles of Government contract administration. Study of contract general and special provisions. Administration of Davis-Bacon Act, Miller Act, and other laws pertaining to construction contracts. Handling of contract modifications, changes, suspension of work, and damages. Study of landmark cases in courts, with decisions of Appeal Boards and Comptroller General. Case problems.

6-371. Government Construction Administration

Spring, 2 credits

PAUL H. GANTT

Consideration of complicated problems of recurring nature in Government construction administration. Study of landmark cases. Tracing of problems from inception to disposition by contracting officers and review authorities. Contract appeal boards and litigations in courts. Seminar discussion, with written materials. *Prerequisite*: Government Construction Contracts, or special permission.

6-638. Government Defense Contracts

Year, 2 credits each semester

EUGENE J. DAVIDSON

Survey and analysis of defense contracts, procurement policies, procedures, and contracting methods. Review of Armed Services Procurement Act, Armed Services Procurement Regulation, other applicable laws and regulations, and decisions of Armed Services Board of Contract Appeals, Comptroller General, Court of Claims, and United States Supreme Court. Contracting by formal advertising and negotiation. Fixed price. Cost reimbursement and incentive-type contracts. Change orders and supplemental agreements. Contract termination (default and convenience). Price re-determination and escalation. Renegotiation. Assignment of claims. Contract financing bonds, labor standards, taxation, contingent fees, and conflicts of interest. Government-furnished property and special relief legislation (P.L. 85-804, and others).

6-565. Inventory Management

Fall, 2 credits

ROBERT H. EAGLE and J. W. PRICHARD

Principles and practices, with emphasis on inventories held to satisfy repetitive demand. Two major decisions of stock replenishment (when to order and how much). Order quantities and reorder points for specific management objectives. Various types of replenishment tables. Interrelationships of economic order quantities, demand forecasting, safety stocks, lead times, reorder points, and inventory costs. Methods of demand forecasting and requirements determination. Replenishment policies to satisfy specific management objectives, or capital, fiscal, personnel, or space constraints.

8-405. Principles of Specifications

(See P. 85)

Accounting

COMMITTEE

Warner H. Hord, *Chairman*

Lawrence W. Acker, Paul L. Appleman, William J. Armstrong, Robert H. Fuchs, Charles N. Mason, Sidney S. Sokol, Herschel C. Walling

The scope of accounting in the Federal service is wide. There are increasing demands for accountants having knowledge of commercial as well as Government accounting. These demands have come as a result of the development of the Joint Financial Management Improvement Program in the Federal Government. The Joint Program is a Government-wide cooperative effort under the joint leadership of the Comptroller General of the United States, the Secretary of the Treasury, and the Director of the Bureau of the Budget. Its purpose is to give the President better financial management in the executive branch, the Congress better information for acting upon appropriations and other legislation, and the public a clearer picture of the financial condition and operations of the Federal Government.

CERTIFIED STATEMENT OF ACCOMPLISHMENT IN ACCOUNTING

The program leading to the Certified Statement of Accomplishment in Accounting is broad enough to cover not only the regular appropriation and fund accounting of the Federal Government, but also the accounting training needed for many other governmental activities. The program is comprehensive enough both to provide advanced training for the Government service, and, if courses are carefully selected, to meet the usual educational requirements for Certified Professional Accountant examinations. The student planning to take a Certified Professional Accountant examination should know the requirements of the State in which he plans to take the examination. In general, the course of study, in addition to accounting, should include the following: Business English, Business Law, Corporation Finance, Investments, Mathematics of Accounting and Investment, and Principles of Economics.

Requirements

1. Graduation from high school, or the equivalent.
2. 36 semester hours of credit with a grade of C or better, as follows:
 - a. Required courses (25 credits):
 - Principles of Accounting (6)
 - Intermediate Accounting (6)
 - Cost Accounting (3)
 - Auditing (4)
 - Advanced Accounting (6)
 - b. Electives (11 credits):
 - Analysis and Interpretation of Financial Statements (2)
 - Budgetary Administration (2)
 - Business Law (4)
 - Cost Accounting (Second Semester) (3)
 - Federal Financial System (2)
 - Federal Government Accounting (4)
 - Federal Income Taxes (3)

Internal Auditing (4)
 Mathematics of Accounting and Investment (3)
 Principles of Economics (6)
 Writing Procedures and Instructions or Official Writing (2)

A student seeking the certified statement should consult with the Registrar and obtain approval of his proposed course of study early in his academic program. He must file a transcript of his high school or college record before completion of his program.

6-342. Accounting for Non-accountants

Fall, 2 credits

HERSCHEL C. WALLING

Survey course designed to familiarize administrators, economists, lawyers, scientists, and other non-accountants with basic accounting concepts, processes, and terminology required for understanding of accounting data. Major principles and conventions of financial and cost accounting, nature and purpose of internal (financial) control, and basic techniques of financial statement analysis and interpretation. Review of double entry, accrual accounting process as basis for understanding resulting accounting data. *Not intended for the student contemplating further study of accounting. Not accepted for credit toward the Certified Statement of Accomplishment in Accounting. Prerequisite:* Work experience in a non-accounting position at Grade GS-11 or above, or special permission.

6-343. Statistical Sampling for Financial Management

Fall, 3 credits. Repeated in Spring

BENJAMIN J. MANDEL

Designed for supervisory personnel in accounting, auditing, and financial management positions in Federal Government, business, and industry. Appreciation of elements of probability sampling closely related to financial management problems. Basic principles and concepts of probability sampling (standard error and sampling distribution), purposes of sample surveys, including estimation, discovery, and work sampling. Efficient techniques of sampling and their application to financial management problems. Solution of common problems encountered in fact-finding. Specific problems. Minimal mathematical and technical derivations. *Prerequisites:* Background in statistics and sampling desirable, but not required.

6-352A. Principles of Accounting—First Half

Fall, 3 credits. Repeated in Spring and Summer

J. VERNON BALLARD
 PAUL S. CARTER
 RONALD J. DUNN
 GEORGE C. KNAPP
 MARVIN H. LEVENBERG

Elementary principles of accounting. Discussion and problems. At the end of the semester, the student is prepared to do accounting necessary for a small business organization; *i.e.*, keep a complete set of books, draw up statements at the end of the fiscal period, adjust accounts for accruals, deferred items, depreciation, and close the books.

6-352B. Principles of Accounting—Second Half

Spring, 3 credits. Repeated in Summer and Fall

J. VERNON BALLARD
 PAUL S. CARTER
 RONALD J. DUNN
 GEORGE C. KNAPP
 MARVIN H. LEVENBERG

Continuation of first half, covering more advanced principles of accounting. Accounting for partnerships, corporations, and manufacturing. Depreciation policies and analysis of financial statements. *Prerequisite:* Principles of Accounting (First Half), or equivalent.

6-353A. Intermediate Accounting—First Half

Fall, 3 credits

WARNER H. HORD

Advanced principles of manufacturing accounting, corporation accounting, and valuation as applied to current assets. Fixed assets, intangibles, and liabilities. Reserves and funds. Installment sales. *Prerequisite*: Principles of Accounting, or equivalent.

6-353B. Intermediate Accounting—Second Half

Spring, 3 credits

WARNER H. HORD

Advanced principles of partnership accounting, including formation, operation, and dissolution. Joint ventures. Consignments. Agencies and branches. Application of funds. *Prerequisite*: Intermediate Accounting (First Half), or equivalent.

6-264. Federal Government Accounting

Year, 2 credits each semester

INSTRUCTOR TO BE ANNOUNCED

First semester: Financial organization for performance of accounting and its relationship with Department of the Treasury and General Accounting Office. Practice work with basic ledgers (allotment ledger, object classification ledger, and general ledger) maintained in connection with funds available to Federal agencies. Appropriation, apportionment, allotment, obligation, disbursement and collection processes. Relationship of accounts maintained in the agency with accounts maintained by Department of the Treasury. Reconciliation of cash accounts with statements furnished the agency by that department. Relationship between general ledger control accounts and subsidiary records. Second semester: General ledger, but involving more complex transactions such as inventory accounting. Accounting in decentralized operation. Accrual accounting concepts as applied to appropriated funds. Year-end closing of accounts and financial reporting and its relationship with Department of the Treasury. Study of accounting problems with emphasis on principles of controls and recent developments in accounting in the Federal Government. In each semester, as applicable, discussion of related reporting and accounting procedures and applicable General Accounting Office instructions. *Prerequisites*: Principles of Accounting and Federal Fiscal Procedure, or equivalent, or experience in accounting operations.

6-420. Advanced Accounting—Theory and Problems

Year, 3 credits each semester

LAURENCE W. ACKER

Advanced principles of accounting and their application to specific problems. Consolidated statements. Foreign exchange. Receivership. Estates and trusts. Public accounts. Emphasis on problems in accounting theory and practice as generally given in Certified Professional Accountant examinations. *Prerequisite*: Intermediate Accounting, or equivalent.

6-423. Mathematics of Accounting and Investment

Spring, 3 credits

RALPH R. BOTTS

Calculation of compound interest, compound discount, amount and present value of annuities, including perpetuities and capitalization methods of determining valuation. Accumulation of sinking funds and amortization of debts by equal payments, with applications to open-end mortgages. Yield and valuation of bonds, various depreciation methods, and exact and approximate methods of determining interest rates charged on time purchases and small loans. Life probabilities and calculation of premiums and cash values for commoner types of life insurance and annuities. Discussion of accounting applications and entries upon request. *Prerequisite*: Intermediate Algebra, including use of exponents and logarithms, or equivalent.

6-510. Analysis and Interpretation of Financial Statements (1963-64 and alternate years)

Spring, 2 credits

HERSCHEL C. WALLING

Methods and techniques of preparing, analyzing, and interpreting financial statements of business and Government enterprises, particularly working capital and revolving funds and Government-owned corporations. Nature and limitations of financial statements, and terminology, content, and organization, and determination and interpretation of trends and ratios for both internal and external users of financial statements. *Prerequisite*: Principles of Accounting.

6-525. Federal Financial System

(See P. 66)

6-642. Cost Accounting

Year, 3 credits each semester

JAMES H. LOBB

Principles of cost accounting, together with methods of application to specific problems. Consideration of methods of cost accounting for materials, labor, direct and indirect expenses in relation to specific job orders. Process, departmental, and standard costs. Control accounts. *Prerequisite*: Principles of Accounting.

6-645. Federal Income Taxes

Fall, 3 credits

LLOYD W. HAMILTON

Principles of Federal income taxation applied to individuals, partnerships, and corporations for determination of gross income, deductions credits, and exemptions. Forms of various tax returns. Application of principles of accounting.

[6-684.] Internal Auditing (1964-65 and alternate years)

Year, 2 credits each semester

JOHN C. COOPER, JR.

Philosophy and purpose of internal audit. Emphasis on use of function as aid to management and operating officials in the Federal Government. The course reflects current concept that internal auditing is an important management control that functions by review and appraisal of other management controls. Topics covered: Appraisal of adequacy of policies, plans, and procedures. Compliance with policies, plans, procedures, regulations, and laws. Proper safeguarding and accounting for agency assets. Ascertaining reliability of accounting and supporting statistical data. Development and utilization of internal audit in the Federal Government. Placement of internal audit function in the organization, its relationship to line operations and line inspections, and its relationship to external audits. Staffing and organization of an internal audit unit, planning of audits, techniques for performance of audits, audit manuals, and reports. Use of case studies and illustrations drawn from experiences in Government agencies. Guest lecturers. *Prerequisite*: Experience in internal audit, administrative or management analysis at Grade GS-7 or above, or courses in advanced accounting or auditing.

6-693. Auditing (1963-64 and alternate years)

Year, 2 credits each semester

JOHN C. COOPER, JR.

Principles and practices involved in commercial-type audits. Consideration of purposes and types of audits. Auditing concepts and standards. Review of internal controls. Planning performing audits. Case studies and problems in auditing theory and practice similar to those included in Certified Professional Accountant examinations. Utilization of audit principles in audits of operations of agencies in the Federal Government. *Prerequisite*: Intermediate Accounting.

Social Sciences

DEPARTMENTAL COMMITTEE

Bushrod W. Allin, *Chairman*

John M. Brewster, John M. Curtis, Joseph L. Fisher, Cannon C. Hearne, Sherman E. Johnson, Erven J. Long, Kenneth E. Ogren, Harold B. Rowe, Harry C. Trelogan (*Vice-chairman*), Frederick V. Waugh, Bennett S. White, Jr.

The problems of social organization and operation have become both absolutely and relatively more important with the increase in the complexity of our industrial civilization. As a consequence, the Federal departments and agencies, as well as governments at state and local level, have need for personnel adequately trained in the social sciences. Moreover, the individual as consumer and investor, the businessman and the farmer as producer, also find need for knowledge of economics and the social sciences. Large corporations employ economists to help in the formulation of policy. Psychologists and social workers find demand for their services in personnel work.

To meet the needs of the Federal employee in particular and of other groups as is feasible, the Department of Social Sciences offers the following courses designed to aid the student in acquiring general background in the social sciences as well as specialized training in fields for which there is current demand.

Economics

COMMITTEE

Kenneth E. Ogren, *Chairman*

James P. Cavin, Nathan M. Koffsky, Howard S. Piquet, Frederick D. Stocker, William A. Vogely

Adequate foundation training in general economics is essential for satisfactory accomplishment in the study of any specialized branch of the subject. Hence, the primary objective in developing the following courses has been that of providing the basic work needed by students who wish to carry out a systematic plan of study, at both undergraduate and graduate levels.

7-2. How and Why of Stock Investments

Fall, non-credit

ROBERT M. GELMAN

Designed to teach the investor fundamental principles of investing in modern securities markets. All aspects of stock market operations. Investment decision-making. Correlation of broader aspects of operations of brokerage firms and members of New York Stock Exchange with what the investor should know about internal operations of stock market. Use of films to supplement lectures.

7-1. Consumer Finance

Spring, non-credit

ROBERT M. GELMAN

Designed to acquaint the consumer with everyday problems of personal finance that he is likely to encounter. Budgeting, borrowing (with emphasis on real cost of money borrowed), installment buying, categories of savings, social security, insurance, and personal taxes. Problems involved in real estate for home owners and investors and in management of one's estate. Use of films to supplement lectures.

7-201. Principles of Economics

Year, 3 credits each semester

FREDERICK D. STOCKER

Designed to familiarize the student with basic tools of economic analysis and their application to questions of economic policy. First semester: Resources, production, and capital formation. Business organization and finance. Money and the banking system. Volume of economic activity and control of fluctuations. Second semester: Functioning of price system. Distribution of national income. International economics. Economic growth. While it is advisable that students registering for the second semester should have completed the first semester, qualified students may be admitted at mid-year.

7-548. Economic Analysis

Year, 3 credits each semester

CLARK EDWARDS

Emphasis on methodology of economic theory. Development of analytical systems to describe and explain such economic phenomena as economic growth, business cycles, decision-making in business firms, taxation, fiscal policy, monetary policy, rate of interest, types of market structure, and related problems. First semester: Working of overall economy. Mechanism of economic growth. Business cycles. Employment. Prices. Rate of interest. Theories of Duesenberry, Fellner, Keynes, Hansen, Harrod, and others. Second semester: Behavior of individual firms and consumers. Types of market structure. Standard price theory, newer approaches of linear programming, theory of games, operating research, and inter-industry analyses. Provides review and updating for those who had undergraduate or graduate training in economics some time ago. *Prerequisite*: Principles of Economics, or equivalent.

[7-570.] Introduction to Econometrics (1964-65 and alternate years)

Year, 3 credits each semester

MARTIN E. ABEL

First semester: Mathematical and statistical concepts used in solution of econometric models. Theory of least squares. Formulation of econometric models. Estimation of parameters of models by least squares. Interpretation and use of estimates. Second semester: Formulation of simultaneous equation models. Methods of estimating parameters and applications. Special problems of formulation and estimation. *e.g.*, serial correlation. *Prerequisites*: Principles of Economics, Mathematics for Economists, or equivalent, and course in statistics including regression analysis.

7-476. Public Finance

Fall, 3 credits

THOMAS F. HADY

Economics of government finance, taxing, borrowing, and spending by Federal, State, and local governments. Emphasis on basic principles and tools of analysis, with current policy issues for illustration. Economics of government spending, allocation of resources between public and private sectors, borrowing and the public debt, fiscal policy, and taxation. General principles of taxation, incidence, and the like. Problems of specific types of taxes. *Prerequisite*: Principles of Economics, or equivalent.

7-239. Strategic Resources and Bases of National Power

Spring, 2 credits

CAREY B. SINGLETON, JR.

Analysis of resources—natural, human, and cultural—and their appraisal, resource patterns, technological progress, minerals, transportation, and economic development. Economic development and employment of resources. International trade and investment and resource use in economic growth. Exploration for minerals, chemical technology, and nuclear energy resources.

7-479. Economics of Mergers and Antitrust

Spring, 2 credits

JOHN J. HURLEY

Economic theory and working of antitrust laws of United States. Business concentration. Market structures. Monopolization and conspiracy mergers. Patents and antitrust. International cartels. Price discrimination. Antitrust remedies.

3-509. Mathematics for Economists (See P. 37)

7-480. Money and Banking

Spring, 3 credits

HARVEY SHAPIRO

Designed to help the student understand functions of money and credit in modern economy. Functions of money. Commercial bank operations and creation of credit. Monetary theory. Principles and practices of central banking and credit control. Role of money in relation to employment, prices, and business cycles. International monetary relations. *Prerequisite*: Principles of Economics, or equivalent.

7-528. International Trade and Commercial Policy

Spring, 3 credits

WILLIAM B. KELLY, JR.

Balanced treatment of theory and practice of international trade and commercial policy, with emphasis on United States. Classical and modern theories of international trade. Balance of payments and adjustments under fixed and fluctuating exchange rates. Tariffs, quotas, trade, and the like. Customs union theory and European Economic Community (EEC), European Free Trade Association (EFTA), and Latin American Free Trade Association (LAFTA). General Agreement on Tariffs and Trade (GATT) and United States trade policy. *Prerequisite*: Principles of Economics.

7-580. Soviet Economy and West

Fall, 3 credits

CAREY B. SINGLETON, JR.

Theory of socialism, Soviet governmental and social system. Structure of Soviet economy. Soviet system of planning and operation. British socialism in operation. Rationale of capitalism. Modern industrialism. Clash of economic systems in competition.

7-468. Economics of Transportation

Fall, 3 credits

JAMES R. SNITZLER and IVON W. ULREY

Past, present, and probable future economic development of nation's rail, highway, water, pipeline, and air transportation systems. Role of legislative branches of government and effect of Federal and State regulation on transportation. Growth of inter-modal competition. Particular emphasis on theory and practice of rate-making and cost-finding. Review of rate and service discrimination. Analysis and uses of sources of capital. Gaps in transportation data and need for transportation research.

7-477. Regional Economic Analysis—Seminar

Spring, 2 credits

E. S. DUNN, Coordinator

Concepts and research tools useful in analyzing regional economic experience. First part devoted to principles governing spatial distribution of economic activities and population. Last part with research tools. Topics: Demographic analysis. Regional income estimation and social accounting. Interregional flow analysis and balance of payments. Regional cycle and multiplier analysis. Regional input-output and linear programming. Gravity. Special interaction models. Applications to regional public and private investment planning problems, to impact and projection problems, and to problems of depressed areas.

7-484. Energy Resource Economics

Fall, 3 credits

GORDON R. CHAPMAN

Survey of energy production in American economy, including coal, gas and oil, and electric power industries. Designed to acquaint the student with sources of information, nature and limitations of statistical data and methods for studying industries. Economic development of industries and relation to total economy. Economic consequences of technological change and government policy. Importance of energy in economy and assessments of future energy use and development.

7-780. Theories of Economic Growth

Spring, 2 credits

WILLIAM E. HENDRIX

Systematic study of economic growth problems and principles. Definitions and elements of economic growth, with emphasis upon natural resources, population, capital, technology, markets, and institutions. Economic growth models under varying stages of development and varying market and institutional limitations. Foreign and domestic applications.

7-414. Economics of Marketing (1963-64 and alternate years)

Year, 2 credits each semester

PAUL E. NELSON and HARRY C. TRELOGAN

Designed to portray and interpret marketing and marketing problems within modern setting. Emphasis on interrelationships between market and other fundamental institutions of economy, and on organization, conduct, and performance of markets. Analysis of relevant theories relating to firm behavior, ranging from pure competition to oligopoly and monopoly. Primary but not sole attention to farm products. Seminar or problem-solving orientation in second semester. *Prerequisites:* Introductory courses in economics and statistics and basic course or experience in marketing field.

7-457. Economics of Agricultural Development

Year, 3 credits each semester

RAYMOND P. CHRISTENSEN

Designed primarily for foreign students. Survey course in economics of agriculture, with special emphasis on role of agriculture in national economic growth. First semester: Principles and elementary tools of economic analysis applicable to agricultural production and marketing problems and with effects of technological improvements, institutional arrangements, and other factors affecting economic progress in agriculture. Second semester: In greater detail, identification of economic problems in agriculture and development of effective research procedures for use in analysis of these problems. Emphasis on application and adaptation of research methods used in United States to economic problems of agricultural development in foreign countries.

[7-434.] Commodity Prices: Origin and Principles of Analysis (1964-65 and alternate years)

Year, 2 credits each semester

HAROLD F. BREIMYER

Designed to blend modern price theory and institutional elements in price-making. Classical, neo-classical, and institutional concepts of price-making process. Distinction between bargaining transaction in market and short- and long-run production responses as influences on price. Role of price support in price-making for agricultural commodities, both storable and perishable. Not methodological course, but acquaints student with analytical techniques appropriate to particular problems. *Prerequisites:* Introductory courses in economics and statistics.

7-716. Agricultural Policies and Programs—Seminar (1963-64 and alternate years)

Spring, 2 credits

WILLARD W. COCHRANE and WALTER W. WILCOX

Analysis and evaluation of current agricultural policies and programs with special reference to planning and programming techniques and processes, including review of policy and program develop-

ment from First World War to date. Consideration of agricultural policies and programs in relation to economic principles as well as chief trends or forces operating within national economy as a whole. Effort to consider all the main streams of agricultural policy, including problems relating to research, education, and marketing, as well as farm price supports. *Prerequisite*: Bachelor's degree in agriculture or related field, with some courses in economics, or operational responsibility in agricultural programs.

7-765. Rural Economic Development—Seminar

Fall, 2 credits

JOHN H. SOUTHERN, Coordinator

Study of low-income problem in United States agriculture and rural areas. Location, magnitude, and persistence of problem. Its economic setting and background. Characteristics of human and physical resources involved. Relationship to technological growth and national economic development. Alternative solutions to problem, including programs under Area Redevelopment Act and Rural Areas Development of Department of Agriculture. Designed to bring to the student understanding of basic causes and characteristics of problem and fundamentals of various approaches to policy measures for problem solution. Conducted by staff members with specialized experience in research and programs.

Human Relations

COMMITTEE

John M. Brewster, *Chairman*

Lee K. Buchanan, Joseph Green, Jr., James O. Howard, Franklin P. Kilpatrick, Conrad F. Taeuber

The following courses in human relations are designed to meet a number of needs on varying levels. Some are for those who want to add to their general knowledge of social problems and processes. There are also courses for the student at the elementary undergraduate level, as well as at the specialized undergraduate and graduate level. Finally, for the mature person, there are courses that try to use the knowledge of all the social sciences in considering public issues and policy.

7-210. General Psychology

Fall, 3 credits. Repeated in Spring

RICHARD S. FITZPATRICK

Psychological theory and principles, based on experimental fact and observation, and interpretation of human relations beginning with development and capabilities of human personality. Adjustment of the personality to environment. Lack of proper adjustment and resulting varying degrees of mental illness calling for psychotherapy. How man sees his world. What influences his relations with his environment. Examination of these relations in selected human situations: Marriage, job, and such problem areas as delinquency, crime, and addiction. The student takes a selected group of psychological tests.

[7-304.] Conditions of Personality Growth (1964-65 and alternate years)

Fall, 2 credits

EUGENE STAMMEYER

Principal factors influencing personality development. Physiological bases, early experiences, and cultural determinants. Experimental and clinical contributions to study of personality and their application to practical problems of understanding and dealing with people.

[7-303.] Child and Adolescent Psychology (1964-65 and alternate years)

Spring, 2 credits

EUGENE STAMMEYER

Development of human behavior from prenatal period through adolescence in terms of processes of physical, mental, emotional, and social growth in the individual. Emphasis on interactions of total personality of the child.

7-714. Emotionally Disturbed Child

Summer, 3 credits

RICHARD S. FITZPATRICK

Biological, psychological, and sociological factors contributing to development of emotional disturbance in children with some emphasis on faculty parent-child relationships. Mental retardation as factor in emotion disturbance. Emotionally disturbed child at home, school, and in community. Problems of diagnosis. Parental attitude as factor in initiation of treatment. Treatment alternatives with some emphasis on group psychotherapy. Treatment settings with some emphasis on residential treatment center. *Prerequisites*: Graduate standing and present employment in teaching or working with children.

7-400. General Semantics

Fall, 2 credits

FRANK R. ELDRIDGE

How we detect meaning, evaluate it, and communicate it to others. How we may become more perceptive as observers, more effective as evaluators, and more explicit as communicators. Devices for realizing how we react to language, how we evaluate it, and how we use it to communicate. Mechanisms that cause confusion of meaning. Clarification by understanding of useful devices and theories applied as tools of analysis, evaluation, and communication.

7-466. General Semantics—Seminar

Spring, 2 credits

FRANK R. ELDRIDGE

Discussion of works of Korzybski. Application of his theories and analyses of written material using general semantic techniques. *Prerequisite*: General Semantics, or equivalent.

7-442. Personality Integration and Problems in Living

Spring, 2 credits

ALBERT C. CORNSWEET

Aspects of personality that contribute to emotional integration of the person. Global and dynamic nature of personality development. Social, economic, culture, environmental, and experimental factors in living. Contributions of variations in these factors to fluctuations in behavioral patterns and difficulties in problems of adjustment and living. Schools of thought contributing to theories of personality. Exploration of these theories as alternate means of dealing with special problems in daily living. Designed to bring about mature comprehension of behavioral variations with recognition and methods of appropriately dealing with them.

7-545. Counseling Techniques

Fall, 3 credits

ALBERT C. CORNSWEET

Survey of theoretical and practical aspects of techniques used in guidance and counseling. Consideration of various schools of thought as related to behavior modification. Emphasis in areas helpful to individuals in fields of counseling, teaching, personnel work, and industrial management. Problem areas and recurring situations in interpersonal relations. Current and basic techniques utilized in direct and indirect counseling methods. Modes of verbal communications. Value of interview material. Assistance to and development of skills to meet exigencies of human factor in teaching, personnel operation, counseling, and industry. Case histories. Individual contributions by students. Also designed to assist individuals to recognize and deal with problem areas in human behavior. Understanding of dynamics of human behavior pertinent in development of these counseling techniques.

7-538. World Population Trends and Problems

Spring, 3 credits

JACOB S. SIEGEL

Population trends and prospects in United States as compared with other areas of the world. Malthusian and subsequent theories of population growth. History of growth and distribution of world's population. Trends in fertility, mortality, and migration, and their analysis in relation to social, biological, psychological, and especially, economic factors. Relation of population growth to economic development and resources. Concept of optimum population. Aesthetic considerations in population growth. Development of national population policies. Population prospects in United States and other countries. Implications for international relations. *Prerequisites*: Training in social sciences and statistics.

7-539. Population and Manpower

Spring, 3 credits

DENIS F. JOHNSTON

Basic concepts and techniques for measuring manpower potentials and labor force. Comparative data on current trends in population, manpower, and labor force in selected industrial and developing countries. Demographic factors as determinants of growth of manpower and labor force. Relation of manpower to labor force: Social and economic determinants of labor force participation in the United States and other selected countries. Techniques in analysis of characteristics and composition of United States labor force. Population and labor force projections and their use in planning. *Prerequisites*: One semester of statistics, one semester of economics, and Introduction to Population Statistics.

7-541. Improving Human Relations and Group Behavior

Fall, 2 credits. Repeated in Spring

CARL F. BAUER

Emphasis on importance of recovering personal identity and responsibility in our mass civilization. Organic experience of organized materials of the course through practice in methods, techniques, and skills of "Group Dynamics." Team method of training leaders, face-to-face analysis, free association, non-directive and developmental discussion, problem census, group decision method, informality, and interviewing.

6-453. Human Relations in Administration (See P. 62)

7-542. Russia: Yesterday, Today, and Tomorrow

Year, 3 credits each semester

ANTHONY F. CZAJKOWSKI

Survey of political, economic, social, and ideological forces in history of Russia influencing current policies. Examination in detail of Soviet expansion after 1945 and events since accession of Khrushchev.

7-640. Medical Sociology

Fall, 3 credits

SAMUEL A. KRAMER

Impact of disease on concepts and structures of social groups. Health and illness affecting and affected by United States cultural patterns. Socio-economic conditions. Folkways. Other factors involved in recognition, availability, and acceptance of medical services through private practice, hospital, clinic, and public health activities. Social stratification and prevailing medical practices. Changing status of medical profession.

7-642. Medical Sociology II

Spring, 2 credits

SAMUEL A. KRAMER

Social and cultural implications of disease. How the community reacts to the sick. Expectations about and by the physician. Medical education as social process. Healing practitioners. Nurse and chiropractor as subprofessionals. Doctor-patient relationships. Social stratification and psychiatry. *Prerequisite*: Medical Sociology, or equivalent.

7-701. Seminar on Psychological Literature

Fall, 3 credits

RICHARD S. FITZPATRICK

Seminar based on seven books in psychology, including those of Freud, Jung, Lindner, and others. Designed for the advanced student, the teacher, and the personnel and counselling psychologist who want to evaluate motivational factors in everyday situations, utilizing new look at psychological theory. *Prerequisites*: Bachelor's degree, courses in psychology, or appropriate experience and special permission.

7-710. Abnormal Psychology

Spring, 3 credits

RICHARD S. FITZPATRICK

Behavior pathology as background for teachers, supervisors, and others dealing with people in effort to assist in early recognition of emotional disorders and to improve adjustment of individual in group setting. History and approaches to study of abnormal behavior. Personality development. Causative factors. Diagnostic categories of abnormal behavior. Treatment and prevention of mental illness. *Prerequisite*: General Psychology.

7-600. Readings and Papers in Human Relations

Fall, 3 credits. Repeated in Spring

RICHARD S. FITZPATRICK, Coordinator

Under guidance of a social scientist, supervised readings with monthly conferences on topics in an area of interest to the student, or individual research and a paper on a problem in human relations. Readings, or the problem to be investigated, are determined in consultation with an advisor. *Prerequisite*: Bachelor's degree, or special permission.

7-216. Suburban Community

Fall, 2 credits

EDWARD V. POPE

Examination of social, economic, and political changes in areas surrounding urban and metropolitan centers. Designed to assist personnel of agencies administering programs to understand nature and impact of these changes, thus enabling them to carry out their responsibilities more effectively. Consideration of areas surrounding cities in connection with major problems associated with urban expansion. Changes in composition of population and mobility. Communication. Transportation. Provision of services. Changes in social institutions such as education, family, religion, recreation, health, and medical care.

7-732. Four-H Club Programs—Seminar

Spring, 3 credits

MYLO S. DOWNEY and STAFF, DIVISION 4-H CLUBS AND YMW PROGRAMS

Major emphasis on objectives and principles for planning effective educational programs for rural young people. Development of volunteer local leadership, advisory, and sponsoring groups, developmental needs of young people, and changing aspects of community life. Class periods devoted to presentations, discussions, and individual papers by instructors and students. Opportunity for development of special problems by individual class members. *Prerequisite*: Course in principles of 4-H Club programs, or substitution of suitable professional experience by special permission.

6-250. American History to 1865 (See P. 63)

6-251. American History Since 1865 (See P. 63)

5-437. History of Science in United States (See P. 50)

Technology

DEPARTMENTAL COMMITTEE

J. P. Schaenzer, *Chairman*

Edward S. Cobb, Evan L. Flory, Garnet W. Jex, Rowland Lyon, E. S. Massie, Elbridge C. Purdy, Henry A. Sawchuk, G. C. Tewinkel, Robley Winfrey

Many departments and agencies of the Federal Government are engaged in programs involving in varying degrees engineering techniques and professional engineers. Among these programs are housing, rural electrification, electric power development and transmission, the application of electronics to industry and transportation, soil conservation, highway planning and construction, and mapping and photogrammetry. Workers in these areas must master numerous functions that require intimate and systematic working knowledge not provided in the standard college engineering and related technical course of study.

Basically, education in engineering schools is limited by necessity and tradition to a period of four or five years. This relatively short training period is sufficient for the mastery of only a minimum of the basic sciences. There is little time for courses that give the technical student an understanding of the social and economic problems of the world around him. As a result, he often fails to appreciate the impact upon society of the advances of his profession. Technological techniques and practices are moving forward at an ever increasing rate. New developments in the sciences and engineering require the enlargement and constant reorientation of the technical background of the engineer.

The Graduate School, with the aid of representatives of Government departments and agencies and of the local chapters of engineering societies, offers courses especially adapted to the technical, professional, and administrative background of engineers in the Federal Government. Because of the competence and experience of the instructors in their respective fields, many of the courses give training in current techniques that the colleges and technical institutes cannot provide. These help the student to broaden his background, to increase his efficiency, and to develop his professional capacity.

Engineering

COMMITTEE

Henry A. Sawchuk, *Chairman*

Walter M. Carleton, Joseph T. Garofalo, J. H. Gehring, Ferdinand Kaufholz, S. D. Keim, Clifford J. Leahy, E. J. Peterson, William D. Potter, John H. Rixse, Jr., F. F. Snyder, Robley Winfrey (Vice-chairman)

If there is sufficient demand, courses similar to the Electrical Engineering Review for P. E. Examination can be given in other engineering fields for the student who wishes to review for the District of Columbia Professional Examinations.

8-92. Review of Engineering Fundamentals for P. E. Examination

Fall, non-credit. Repeated in Spring

JOHN H. RIXSE, JR.

Refresher course in basic sciences and engineering principles intended to assist in preparation for basic portions of District of Columbia Professional Engineer's License Examination (not specific branches of engineering). Covers elements of strength of materials, structures, fluid mechanics, mechanical engineering, electrical engineering and engineering economics. *Prerequisite*: Preferred, those qualified to take the examination.

8-95. Electrical Engineering Review for P. E. Examination

Fall, non-credit. Repeated in Spring

J. J. A. JESSEL
ALMON D. THOMAS
LOUIS M. TIERNEY

Refresher course for the student preparing for the D. C. Professional Engineer's License Examination in field of electrical engineering with emphasis on power. Solutions of practical problems. *Prerequisite*: Preferred, those qualified to take the examination.

8-96. Public Utilities Regulation and Rates

Spring, non-credit

LOUIS ZANOFF

Regulation of natural gas and electric utilities.

8-97. Mathematics for Applied Electricity

Fall, non-credit

DAVID ASKEGAARD

Mathematics most commonly used in applied engineering, especially electricity and electronics. Use of slide rule for multiplication and division. Scientific notations for large and small numbers. Use of simple algebraic equations, logarithms, elementary trigonometry, and complex numbers. Addition, subtraction, multiplication, and division of vectors. Helpful for course in Principles of Electricity. Recommended for the student planning to do additional work in field of electricity, unless he has already studied algebra and trigonometry.

8-110. Principles of Electricity

Spring, 2 credits

DAVID ASKEGAARD

Principles of electricity, emphasizing alternating currents. Basic units such as voltage, current and power and their measurement, resistance, voltage regulation, line loss, power factor, and three phase systems. Function of equipment used on rural electric distribution systems such as generators, substations, transformers, lightning arrestors, fuses, and oil circuit reclosers.

8-115. Fundamentals of Radio and Television

Year, 3 credits each semester

ROBERT HAUPTMAN

Lecture course covering practical aspects of radio, television, and related subjects. First semester: Electronics fundamentals, amplifiers, and radio receivers. Specific topics: Principles of electronics and radio. Electronic components. DC and AC circuit characteristics and analysis. Electron tubes. Amplifiers. Radio receiver fundamentals and applications. Second semester: Radio transmitters, FM, TV, and miscellaneous subjects. Specific topics: Radio frequency regeneration. Radio transmitter fundamentals and applications. Fundamentals and applications of frequency modulation and television. Propagation, radiation, and antennas. Sources of power. Test equipment. *Not a laboratory course. Prerequisites*: Mathematics for Applied Electricity and Principles of Electricity, or equivalent.

8-465. Applied Electronic Theory

Year, 3 credits each semester

JOHN J. CULLINANE

Analytical presentation of principles of electronics. First semester: Elementary circuit analysis involving linear, passive components. Characteristics of resonant circuits, transformers, transmission lines, and antennas. Fundamental principles of electron tubes including diodes, triodes, and pentodes. Voltage amplification. Second semester: Untuned and tuned amplifiers. Class A, B, and C power amplifiers. Rectifiers and power supplies. Sine-wave oscillators. Amplitude modulation and detection. Frequency modulation. Transmitters. Receivers including superheterodyne. Basic pulse circuits. Television fundamentals. *Prerequisites*: Mathematics for Applied Electricity and Principles of Electricity, or equivalent college level courses in DC and AC circuits, algebra, and trigonometry. Calculus helpful, but not necessary.

8-525. Transistor Electronics

Fall, 3 credits

CARLYLE V. PARKER

Introduction to semiconductor principles. Point contact transistors. Junction transistor and p-n-p and n-p-n transistor characteristics. Transistors as low and high frequencies circuit elements. Transistor amplifiers and oscillators. Measurement of small signal parameters (α , a and b).

Cascade amplifiers. Noise in transistors. Compensation for temperature variation. Equivalent network circuits. Other related topics. *Prerequisite*: Bachelor's degree in electrical engineering, physics, or equivalent professional experience.

8-100. Servomechanisms

Fall, 3 credits

JAMES W. TITUS

Basic theory of linear servomechanisms and methods for analysis and design of practical systems. *Prerequisites*: Mathematics through differential equations and physics: Mechanics and elementary electric circuits.

8-105. Radar Systems Engineering

Fall, 2 credits

CHARLES W. GILL

Principal components of radar systems. Interrelations of various parameters that affect radar range. Survey of various types of radar systems. Applicability of these to perform particular tasks. *Prerequisite*: Bachelor's degree in engineering or physical sciences, or equivalent professional experience.

8-690. Nuclear Reactors

Fall, 2 credits

FRED SCHULMAN

Nuclear physics review. Reactor physics. Radioactivity. Types of reactors. Elementary design considerations. Properties of materials related to reactor technology. Biological effects of radiation. Reprocessing of fuels. United States and foreign reactor programs. *Prerequisite*: Bachelor's degree in science or engineering, or special permission.

8-101. Introduction to Metallurgy

Fall, 2 credits

BLAKE M. LORING

Winning of metals from ore, including iron and steel, copper, lead, zinc, and less common metals. Basic principles of physical metallurgy, including mechanical properties, heat treatments, recrystallization phenomena, and equilibrium diagram. Basic characteristics governing wide range of metallurgical processes. Designed especially for the non-metallurgist and the undergraduate.

8-705. Nuclear Metallurgy

Spring, 2 credits

BLAKE M. LORING

Physical metallurgy of materials for nuclear power reactors. Alloy diagrams of thorium, uranium, and plutonium. Preparation, investigation, and use of fissionable materials including precautions in handling. Auxiliary nuclear metals such as beryllium, zirconium, and metals for transfer of heat. Discussion of pertinent effects such as radiation damage and mass transfer. *Prerequisite*: Bachelor's degree in engineering, or special permission.

8-405. Principles of Specifications

Fall, 2 credits

BENJAMIN ROSENZWEIG

Principles underlying Government specifications systems. Survey of procurement documents and their purposes. Organization of specifications for form, clarity, and effectiveness. Evolution and ramifications of specifications with regard to research and development. Legal and contractual relations. Proprietary items. Government inspection. Division of specifications into performance and formulation types. Standardization and industry coordination. *Prerequisite*: Knowledge of procurement, inspection, research, and development processes, or specification writing.

8-682. Elements of Digital Data Processing

Fall, 3 credits. Repeated in Spring

DONALD F. MILESON

Basic theory and general principles of digital computing equipment. Binary, octal, and decimal numbering systems and conversions between systems. Binary arithmetic, truth tables, and concepts of Boolean algebra. Logical simplification. Mechanization of logic circuits. Memory and input-

output devices. Timing and control, counters, registers, and the like. Fundamental computer design utilizing basic circuits. Principles of computer programming. *Prerequisites:* College algebra and basic electrical engineering courses, or special permission.

8-695. Engineering Reliability

Year, 2 credits each semester

H. WALTER PRICE

Designed for the engineer desiring to acquire comprehension of reliability concepts and to develop working knowledge of reliability techniques. Basic probability and statistics pertaining to reliability. Failure, survival, and failure rate functions. Exponential distribution. Weibull distribution. Gamma distribution. Evolutionary or response-surface techniques. Stress domains. Reliability effects of temperature, shock, vibration, humidity, and electrical stresses. System reliability. Probabilistic environmental-encounter and use-encounter analyses. Design parameter analysis. Design reliability. Specification reliability index analysis. Circuit reliability analysis. Reliability of parallel circuits. Mean-life of parallel elements. Probe test. Manufacturing reliability. Life-testing. Accelerated life-testing. Type B value engineering. Economic decision method. Maintainability. Optimum search techniques. Optimum module size. Availability. Logistics. Use of models and games to illustrate concepts. Solution of simulated reliability problems in class. Discussion of specific reliability problems submitted by students. *Prerequisite:* Degree in engineering, or special permission.

8-697. Highway Location and Design

Fall, 3 credits

FOREST H. GREEN

Basic principles of highway location, including recognition of topographic and cultural influences and application of road-use analyses. Use of airphoto interpretation methods, photogrammetry, and ground-reconnaissance surveys. Development of curvilinear alignments. Development and general application of geometric design standards, with special emphasis on freeway design. *Prerequisite:* Degree in civil engineering, or special permission.

8-698. Traffic Planning and Operations

Spring, 3 credits

FOREST H. GREEN

Urban traffic patterns. Traffic surveys and traffic volume predictions. Traffic assignment to proposed facilities and development of design volumes. Principles of traffic operations, including use of one-way streets, signals, and local improvements. Organization and operation of traffic engineering departments. *Prerequisite:* Degree in civil engineering, or special permission.

8-710. Steam Power Plants

Year, 3 credits each semester

C. D. STATTON and ASSOCIATES

Design and construction of modern-day steam power plant and associated operations. Maintenance and economic considerations. Emphasis on present and future power generation requirements. Unit design. Plant design. Fuels. Steam generators and auxiliary equipment and specific fuel applications. Piping design fabrication and layout. Water technology. Turbine generators and auxiliary and control equipment. Electrical systems and equipment including protection. Control and information handling systems, including data logging. Power plant auxiliary equipment such as condensers, heat exchangers, and pumps. Standards. Operations. Engineering supervision, inspection, and performance testing. *Prerequisites:* Engineering degree or equivalent experience, preferably including basic course in thermodynamics.

8-715. Electric Power Transmission

Year, 3 credits each semester

R. J. MATHER and ASSOCIATES

Design and construction of electric power transmission lines and systems and associated operations, maintenance, and economic considerations. Present and future transmission needs. System analysis. Stability (steady state and transient). Load flow. Interconnections. Lightning. Switching. National standards. Structures. Conductor. Hardware. Grounding. Relaying. Communications and control systems. Line layout. Plan and profile. Construction techniques. Materials handling. Engineering inspection and supervision. *Prerequisites:* Engineering degree or equivalent experience, preferably including basic courses in electrical engineering.

Surveying and Mapping

COMMITTEE

G. C. Tewinkel, *Chairman*

D. A. Bucci, Walter Dix, Cecil Ellingwood, Randall D. Esten, George H. Everett, James P. Fondren, S. J. Friedman, E. S. Massie (Vice-chairman), W. R. Nunn, Jr., Rupert B. Southard, Jr.

The field of transportation, whether by land, sea, or air presupposes the existence of navigational charts based on accurate geodetic surveys. The planning and construction of our public roads system, as well as pipe lines, transmission lines, and canals, are based on accurately prepared engineering plans. These depict the surface of the ground in three dimensions and contain all the surface and subsurface information that affects the economy of the operations. The reliability of charts and plans relates to probability, statistics, error analyses, and sampling to maintain the cost and accuracy of the plan in proper balance with the total cost of the facility.

Satellites offer a new method for geodesists to determine the actual shape of the earth. Electronics offers new systems for distance measurement and new vistas of automation. Photogrammetry offers a modern tool for expediting topographic mapping. Cartography recognizes modern navigational needs by altering the appearance of its products to conform to new speeds, new instruments, and new vehicles. All these topics relate to applied physics and mathematics. A proper understanding of these ideas is important in the relationship of the specific function of a map-maker to the total field. The following curriculum is designed to assist the inquisitive map-maker in acquiring this understanding.

CERTIFIED STATEMENTS OF ACCOMPLISHMENT IN SURVEYING AND MAPPING

Certified Statements of Accomplishment in Surveying and Mapping are granted to the undergraduate and advanced student who complete organized courses of study intended to provide basic training for responsible work in surveying and mapping.

Certified Statement of Accomplishment—Undergraduate

The program leading to the Undergraduate Certified Statement of Accomplishment in Surveying and Mapping provides training approximately equivalent to that gained from a year of technical college work. Graduation from high school is the minimal educational background required, but some college work is desirable.

Requirements (30 credits)

1. Required prerequisite courses:

College algebra

Trigonometry

2. 26 semester hours of credit with a grade of C or better in each of the following courses:

Introduction to Cartography (2)

Elementary Surveying (3)

Topographic Surveying (3)

Photogrammetry I (3)

- Photogrammetry II (3)
- Aerial Photographic Interpretation (3)
- Trigonometry for Cartographers (4)
- Map Projections and Grid Systems (3)
- Cartographic Techniques and Map Reproduction (2)

3. 4 semester hours of credit with a grade of C or better in courses selected from related electives listed under the Advanced Certified Statement of Accomplishment.

Certified Statement of Accomplishment—Advanced

The program leading to the Advanced Certified Statement of Accomplishment in Surveying and Mapping provides training at least at the level of the master's degree. Although neither certified statement requires any specified work at the college level, the student is reminded that completion of courses in the broader and nontechnical subjects integral to the standard college curriculum is an important part of his general preparation for responsible work in this profession.

Requirements (30 credits)

1. Required prerequisite courses:

- College algebra
- Trigonometry
- Analytic geometry
- Calculus

2. 21 semester hours of credit with a grade of B or better in each of the following courses:

- Astronomy for Engineers (3)
- Geodetic Surveying (3)
- Computation and Adjustment of Geodetic Observations (3)
- Photogrammetry II (3)
- Photogrammetry III (3)
- Map Design (2)
- Official Writing or Technical Writing (2)
- Editing Technical Manuscripts (2)

3. 9 semester hours of credit with a grade of B or better selected from the following related electives, or 17 semester hours if both certified statements are received.

- Route Surveying (3)
- Advanced Aerial Photographic Interpretation (3)
- General Geology (3)
- Historical Geology (3)
- Maps and Charts (2)
- Theory of Errors (3)
- General Meteorology (3)
- Applied Electronic Theory (4)
- Fundamentals of Radio and Television (6)
- Official Writing (Undergraduate only) (2)
- General Oceanography (3)

Equivalent courses will be accepted by transfer from other colleges and universities. An applicant for either certified statement must file a transcript of his high school or college record before completion of his program.

Surveying

8-132. Introduction to Geodesy

Fall, 2 credits

PAUL D. THOMAS

Series of lectures designed to acquaint the student with many general topics involved in geodesy and the space age, with particular emphasis on modern thinking and methods. Use of mathematics minimized to fit capabilities of a particular class. Nevertheless, mathematical principles through trigonometry desirable and helpful. Topics include: Some elements of plane and spherical trigonometry. Figure of earth. Principles of motion and gravity. Triangulation, trilateration, geodetic leveling, gravimetry, astronomic observations, azimuth, and earth magnetism. Geodetic datums. Solar eclipses. Geodetic satellites. Some geometric problems encountered in lunar mapping, instruments, and methods.

[8-135.] Elementary Surveying (1964-65 *and alternate years*)

Fall, 3 credits

CECIL ELLINGWOOD

Use of transit, level, compass, and accessory equipment. Adjustment of instruments. Field methods of transit-and-tape traverse and engineers' leveling (differential and profile). Computations connected with above including adjustment of traverses by compass and transit rules. Computation of latitudes, departures, and areas. Lectures, classroom work, and field work. *Prerequisite*: Plane trigonometry.

[8-204.] Ground Methods of Topographic Surveying (1965-66 *and every third year*)

Spring, 3 credits

CECIL ELLINGWOOD

Stadia method. Mapping with transit. Plane table mapping. Plane table triangulation and special problems. Methods and practices in map construction. *Prerequisite*: Elementary Surveying.

8-215. Route Surveying (1963-64 *and every third year*)

Fall, 3 credits

CECIL ELLINGWOOD

Theory and practice of surveying for railroads, highways, and canals. Preliminary and location surveys, cross sections, earthwork quantities, and transition spirals. Lectures, classrooms, and field work. *Prerequisites*: Elementary Surveying and plane trigonometry.

8-217. Astronomy for Engineers (1963-64 *and every third year*)

Spring, 3 credits

CECIL ELLINGWOOD

Fundamentals of circular systems. Basis of determination of time, longitude, latitude, and azimuth. Use of instrumental equipment. *Prerequisite*: Elementary Surveying.

[8-218.] Geodetic Surveying (1964-65 *and every third year*)

Fall, 3 credits

CECIL ELLINGWOOD

Theory and practice of first- and second-order triangulation, traverse, and leveling. Use of base-line equipment, repeating and direction theodolites, and geodetic leveling equipment. Field computations necessary to insure accuracy of observations. *Prerequisite*: Elementary Surveying, or special permission.

[8-219.] Computation and Adjustment of Geodetic Observations (1964-65 and every third year)

Spring, 3 credits

CECIL ELLINGWOOD

Office procedures in final computation and adjustment of field observations introduced in Geodetic Surveying. Least square approach to adjustment of networks of traverse and leveling and simple triangulation figures. *Prerequisite*: Geodetic Surveying, or equivalent, or special permission.

Photogrammetry

8-120. Introduction to Photogrammetry

Fall, 2 credits

RUPERT B. SOUTHARD, JR.

Lectures and demonstrations in simple terms. General knowledge of photogrammetry History, simple optics, fundamental photographic principles, types of aerial cameras, accessories, and photographic aircraft. Topographic mapping by photogrammetry, photointerpretation, geodetic control requirements for photogrammetry, extension techniques for control, and basic instrumentation for photogrammetry. Current developments and future aspects of photogrammetric science.

8-208. Aerial Photographic Interpretation

Fall, 3 credits

ETHAN D. CHURCHILL

Principles, techniques, and applications of aerial photographic interpretations. History, concepts, types of aerial photographs, principles, techniques, and applications. Study, and use in various fields, of aerial photographs as source of detailed natural and cultural information. *Prerequisite*: General background in one of the following—surveying and mapping, cartography, geography, geology, forestry, agriculture, architecture, or allied engineering fields.

8-408. Advanced Aerial Photographic Interpretation (1963-64 and alternate years)

Spring, 3 credits

ETHAN D. CHURCHILL

Seminar on application of aerial photographic interpretation to specialized technical fields, such as forest, range, and wildlife management. Agricultural soil, engineering soil, and vegetation surveys. Geology and petroleum geology. Population census in rural and urban areas. *Prerequisite*: Basic training in aerial photographic interpretation. Training in forestry, range management, wildlife management, agriculture, ecology, geography, geology, or engineering desirable.

8-251. Photogrammetry I

Fall, 3 credits

RUPERT B. SOUTHARD, JR.

Basic theory of photogrammetry. Elements of photogrammetric optics. Geometry of aerial photograph. Types, nomenclature, and capabilities of aerial cameras and accessories. Characteristics of photographic aircraft. Elements, instrumentation, and materials of photography. Scale considerations. Flight planning. Field surveys for photogrammetry. Radial-line methods for control extension and plotting. Stereoscopy and parallax, mosaics, and photointerpretation. *Prerequisites*: Trigonometry for Cartographers, or equivalent.

8-252. Photogrammetry II

Spring, 3 credits

RUPERT B. SOUTHARD, JR.

Continuation of basic photogrammetric theory and practice. Geometry of tilted photographs. Principles of stereophotogrammetry. Stereoscopic plotting instruments. Techniques for oblique photogrammetry. Photogrammetric control techniques. Compilation. Current developments in photogrammetry. Future trends. *Prerequisite*: Photogrammetry I.

8-480. Photogrammetry III (1963-64 and alternate years)

Fall, 3 credits

G. C. TEWINKEL
CHARLES E. COOK

Advanced practical numerical details in form of applied analytic geometry. Graphic, semigraphic, and analytic methods for adjusting strips and blocks of aerotriangulation. Introduction to plane and solid analytic geometry, matrix algebra, and least square principles. Compensation for systematic errors of lens distortion, film distortion, atmospheric refraction, and earth curvature. Numerical relative orientation and numerical rectification. Introduction to application of electronic computers. Methods for exploiting full accuracy potential of photogrammetry. *Prerequisite*: Photogrammetry II.

3-508. Theory of Errors (See P. 37)

Cartography

8-125. Introduction to Cartography

Spring, 2 credits

WILLIAM A. FOSTER

General instruction in history of maps. Shape of earth. Fundamental concepts of common projections. Basic principles of plane and geodetic surveying. Topography. Hydrography. Photogrammetry. Oceanography. Classification, evaluation, compilation, construction, and revision of maps and charts. Methods and techniques of reproduction. Surveying with electronics.

2-114. Maps and Charts (See P. 27)

8-240. Cartographic Techniques and Map Reproduction

Spring, 2 credits

ANTHONY S. BASILE

Factors, commensurate with scale, to be considered before designing a chart or map for reproduction. Selection of reproduction process. Shaping of job for selected process. Reproduction support during the compilation stage. Types of line and half tone copy. Types of media used for line, half tone, and scribed originals. Color separations. Relief techniques. Reproduction techniques utilized in correcting chart/map to date. Cartographic typography. Photolithography, letter press, gravure, ozalid, and photogelatin processes, including historical background. Demonstrations of cartographic and reproduction techniques utilized by U. S. Navy Hydrographic Office, Coast and Geodetic Survey, Army Map Service, U. S. Geological Survey, and National Geographic Society, including historical background. Estimating man-hour costs. *Prerequisite*: Introduction to Cartography, or special permission.

8-222. Trigonometry for Cartographers

Year, 2 credits each semester

GEORGE H. EVERETT

Knowledge of trigonometry basic to understanding procedures of photogrammetry, surveying, and mapping. First semester: Basic functions. Solutions of plane triangles. Theorems. Identities. Graphs. Inverse functions. Complex numbers. Logarithms. Second semester: Spherical trigonometry. Solution of spherical triangle. Napier's rules. Napier's analogies. Gauss' equations. Haversine formulas. Spherical excess. Terrestrial sphere and great circle problems. Celestial sphere and astronomic triangle problems.

8-223. Map Projections and Grid Systems

Spring, 2 credits

EDWARD W. FONFARA

Basic principles with practical applications. Computations. Use of tables. Layouts. Definitions. Classifications. Characteristics. Identification of such standard projections as the polyconic, mercator, transverse mercator, Lambert conformal, gnomonic, and stereographic. Coordinate systems including rectangular, broad-area, and true military grid. Presented from practical point of view without complex variable theory applications. *Prerequisite*: College trigonometry.

8-426. Map Design

Fall, 2 credits

ROBERT B. MERCREADY

Factors relating to selection of map material. Projects based on information and map data for purpose of map compilation. Maps and charts produced mostly for United States Federal departments and agencies, but including those of foreign governments and private companies to determine application of selection of map materials. Field trips to Federal departments and agencies and private companies in Washington area.

Fine and Applied Arts

COMMITTEE

Rowland Lyon, *Chairman*

Sadye F. Adelson, O. A. de la Rosa, Howard B. Dominick, Martha L. Hensley, Garnet W. Jex (Vice-chairman), George E. Muth

The courses offered in the fine and applied arts are of general interest.

Fine Arts

8-320. Pencil Sketching and Water Color Painting

Fall, 2 credits. Repeated in Spring and Summer

JAMES V. CUPOLI

Informal course in theory and practice of pencil sketching and ways and means of water color. Demonstrations in both media. The student may use either or both media.

8-332. Introduction to Creative Expression

Fall, 2 credits

DUANE A. MCKENNA

For the student without previous art training who seeks personal enrichment or pleasure of self-expression through drawing.

8-321. Creative Expression from Life

Spring, 2 credits

DUANE A. MCKENNA

Sketching for practical skill and pleasure using pencil and other media, according to needs of the student. Emphasis on action drawing from nature. Outside observations and field trips supplement work from model. Challenges basic, but practicing artist finds course valuable refresher.

8-323. Portrait Painting in Oil

Fall, 2 credits. Repeated in Spring

PIETRO LAZZARI

Professional methods of painting oil portraits incorporating basic techniques of old masters and spirit of modern art. Sketching, line composition, and light arrangement. Color, theory, and technique of painting in oil. All work from life. *Prerequisite:* Desire to do portrait painting. No experience required.

8-338. Life Sketching

Fall, 2 credits. Repeated in Spring

JAMES V. CUPOLI

Life and figure sketching of human figure. Painting of figure for the advanced student.

8-355. Creative Painting

Fall, 2 credits. Repeated in Spring

BENJAMIN ABRAWOWITZ

Workshop stressing individual work for the student at each stage of development. Direction in organizing natural and imaginative forms, with emphasis on expressive possibilities of color and composition. Orientation in contemporary painting techniques. Discussions, analysis, and demonstrations leading to development of critical values. Preparation, care, and use of materials. Framing and exhibition procedures. Indoor and outdoor painting sessions. No previous training necessary.

8-357. Etching

Fall, 2 credits. Repeated in Spring

EUGENE W. FREDERICK

Practice combined with lecture and demonstration to enable the student to produce his own prints in all phases of etching. Workshop to establish solid foundation to overcome technical problems. Emphasis on craft with time for free experimentation. No previous experience necessary, but knowledge of the drawing helpful. More advanced techniques for the student who repeats course.

8-333. Art Appreciation and Survey

Fall, 2 credits

ROGER L. SELBY

Designed for the beginning student. Against framework of development of painting, sculpture, and architecture from prehistoric to recent times, the student is given basic vocabulary, appreciation, and understanding of the fine arts.

8-334. Modern Art: Its Sources and Development

Spring, 2 credits

ROGER L. SELBY

To further the student's knowledge, appreciation, and understanding of his contemporary heritage.

8-336. History of Art in America

Summer, 2 credits

ROGER L. SELBY

Developmental survey of American painting and sculpture from seventeenth to twentieth century.

8-370. Music Appreciation

Fall, 2

JOHN SHORTRIDGE

Designed to develop ability to enjoy music through study of musical styles, forms, and instruments of various periods. Consideration of changing role of music in society through the ages. Recordings and live performances.

8-359. Theater

Fall, 2 credits

HELEN G. HICKS

Designed to develop appreciation and judgment of all arts of theater to make theater-going more meaningful. Consideration of plays and playwrights from Greeks to now. Actors, directors, scenic artists, and critics. Introduction to great artists of theater. Lectures, reading of plays, critiques, and playgoing.

8-365. Actor's Workshop

Spring, 2 credits

HELEN G. HICKS

Workshop for those who would work seriously at art and craft of acting under experienced coach and director. Exercises for flexibility of voice and speech. Pantomime and improvisation. Reading of lines and creating of character. Scenes and group performance. Critical discussion. Consistent attendance imperative.

Applied Arts

8-35. Introduction to Institutional Housekeeping

Fall, non-credit

EMMA MORGAN and ASSOCIATES

Introduction to fundamentals of institutional housekeeping for hotels, hospitals, motels, college dormitories, fraternity and sorority houses, and similar institutions. Basic principles of the work. Attractive to the woman planning another type of job when the younger generation is challenging her position. Field trips and demonstrations.

8-36. Institutional Housekeeping II

Spring, non-credit

EMMA MORGAN and ASSOCIATES

Further study of rapidly expanding field. Rules and practices of many varied duties of Executive Housekeeper. *Prerequisite*: Introduction to Institutional Housekeeping, or practical experience in a supervisory capacity.

8-55. Introduction to Interior Decoration

Fall, non-credit. Repeated in Spring

MARGARET A. STEININGER

Designed for those who wish nonprofessional knowledge of principles of design and color to help them with their home decorating problems. Design, color furniture arrangement, floor and wall coverings, textiles, accessories, lighting, and setting up of actual floor plans of rooms.

8-60. Art in Personal Clothing

Fall, non-credit

BRIDGET MAGINN

Designed for understanding of art in choice of personal clothing and accessories. History of costume design. Study of fibers, yarns, fabric construction, and finishes for quality and serviceability. Principles of dress design. Color and texture choice for individual wardrobe planning.

8-144. Graphic Arts in the Federal Government (1962-63 and 1963-64. *Not offered 1964-65*)

Year, 2 credits each semester

MAURICE EYSENBERG and WILLIAM WILSON TAYLOR

Introductory survey of field of graphic arts in the Federal Government. For practicing artists, designers, and others concerned with preparation and use of visual materials in many media. Classroom lectures and demonstrations, discussion, and analysis of homework by staff and visiting experts.

[8-322.] Art, Layout, and Design for Reproduction (1964-65 and every third year)

Fall, 2 credits

WILLIAM WILSON TAYLOR

Designed to help administrators, draftsmen, editors, educators, and writers visualize their communications more effectively and improve ultimate understanding.

[8-145.] Layout in Visual Communication (1964-65 and every third year)

Spring, 2 credits

MAURICE EYSENBERG

Layout as first step in visual communication, such as a chart, poster, slide, printed page, exhibit, and the like. Classroom discussion, demonstration, comparison, and analysis. Home assignments to practice and apply basic rules.

8-284. Landscape Design of Small Property

Fall, 2 credits

HENRY SCHULTHEIS

Introduction to fundamentals of landscape design. Emphasis on small properties of one-half to one acre. Principles of orientation, arrangement, and circulation, as related to topography, solar orientation, verdure, subgrade conditions, utilities, and prevailing winds.

8-285. Landscape Use of Trees, Shrubs, Vines, and Flowers

Spring, 2 credits

HENRY SCHULTHEIS

Continuation of Landscape Design of Small Property. Emphasis on principles and practices relating to execution of mass tree and shrub outlines. Types and characteristics of evergreens and deciduous trees, shrubs, and vines. Review of care and maintenance of tree and shrub plantings, lawns, and gardens. Seminar at Annual Flower Show in visual research of garden design and use of plant materials in three dimensions as well as color. A student may register for the second semester without the first.

Photography and Lithography

COMMITTEE

Elbridge C. Purdy, *Chairman*

Edward S. Cobb (Vice-chairman), Raymond Davis, Fred W. Gerretson, Julius Halsman, Joseph F. Hamm, R. J. Lefebre, Keith B. Lewis, Albert R. Materazzi, Albert W. Matthews, Charles T. Myers, Jr., F. M. Orsini, Howland Pike

Advances in the use of light sensitive materials in the arts and sciences and in industry have caused demand for new and refresher training in the fields of photography and lithography. The development of the printing arts has similarly opened up new areas of training. The following courses are intended to meet these and other related needs. The courses are designed to furnish basic technical information applicable to all areas. They also develop special skills for particular applications. Finally, they try to satisfy special requirements within the photographic and allied industries.

8-70. Popular Photography

Fall, non-credit. Repeated in Spring and Summer

NORMAN LEE McCULLOUGH

Nontechnical demonstration course. Designed for camera enthusiasts desiring to understand how their cameras, films, and prints work. Camera types and operation. Film types and uses. Developing and printing. Filters. Exposures. Planning, composition, and lighting. Portraiture. Motion pictures. Color photography. Exhibition and demonstration of equipment, materials, and techniques.

8-192. Fundamentals of Photography I

Fall, 2 credits. Repeated in Spring

EDWARD S. COBB

Principles of photography. Foundation for more advanced courses in photography. Nature of photographic process. Light as applied to photography. Development of chemicals. Factors in development. Judging exposure, lenses, and image formation. Effects of lighting subject. Shutter performance. Fixing and washing.

8-193. Practice of Photography I

Fall, 3 credits. Repeated in Spring

WALTER N. JOHNSON

Laboratory practice and demonstration of principles taught in Fundamentals of Photography I. It offers the student opportunity to become familiar with recommended procedures and techniques. Contact printing and processing. Selection of printing papers. Processing of negative roll film, cut film, and film pack. Diagnosis and remedy of processing defects. Types of cameras, their operation and uses, and application of filters.

8-195. Fundamentals of Photography II

Spring, 2 credits

ALBERT R. MERRITT

Theory to obtain good negative by controlled exposure and development. Principles of projection printing. Proper selection and utilization of darkroom equipment. Quality control procedures in everyday photography. Photo-sensitive materials. Use of exposure meter. Functions of light filters. Types of lighting. Science of sensitometry to measure and control photographic process. *Prerequisites:* Fundamentals of Photography I and Practice of Photography I, or equivalent.

8-196. Practice of Photography II

Spring, 2 credits

HARRY L. BURNETT, JR.

Projection printing. Application of sensitometric measurements. Print correction. Composite printing. Use of variable contrast papers. Lighting. Rendition of form and texture. Light patterns. Effect of light on color, toning, and print quality analysis. *Prerequisites:* Fundamentals of Photography I, Practice of Photography I, and Fundamentals of Photography II. May be taken concurrently with Fundamentals of Photography II. *Each student must have access to outside laboratory facilities.*

8-360. Portrait Photography

Year, 2 credits each semester

ELBRIDGE C. PURDY

Studio and darkroom course with opportunity for practice. The student learns through individual guidance the subtleties of fine portrait work. Lighting, posing, composition, processing, and retouching. *Prerequisite:* Practice of Photography II.

8-270. Color Photography, Monopack Color Printing

Year, 3 credits each semester

OSCAR RODBELL

Basic theory and practice in making color prints on positive color "Printon" and color negative "Ektacolor" materials. Lectures: Basic theory, nature of color and light, three-color theory, formation of colors, additive and subtractive processes, color temperatures, and transmission and absorption of filters. Laboratory: Selection of equipment, evaluation of transparencies and color negatives, proper exposure controls, mixing of chemical solutions, controls in color processing, and practical application of these fundamentals. *Prerequisite:* Background in black and white photography and 4- X 5-inch color negatives for practical application in laboratory, or special permission.

8-194. Creative Photography through Composition I

Fall, 2 credits

MARTIN H. MILLER

Practical help for beginner as well as experienced photographer. Intended to develop understanding of composition and design. Practice in applying to the photographs of the student elements of composition that make superior pictures. Criticism and suggestions on prints and color slides. Course applies to color slides, color prints, and black and white photographs. Discussion of original photographs by outstanding pictorial and photo-journalist photographers. Field trip.

8-197. Creative Photography through Composition II

Spring, 2 credits

MARTIN H. MILLER

Continuation of Creative Photography through Composition I. Practical help for the student to improve his pictures. Review of basic principles of composition and application to the work of the student. Course applies to color slides, color prints, and black and white photographs. How to see a picture. How to present subject matter in interesting fashion. Use of photographs as medium

of communication. Night photography. Prize-winning pictures. Pictures for exhibition. Criticism and suggestions on prints and color slides and practice in analyzing and judging photographs. Several picture-taking field trips. A student may register for the second semester without the first.

8-198. Photo-journalism

Fall, 2 credits

RUSSELL T. FORTE

Theory and practice, with "how-to" approach as means of communicating through photographs and words. Analysis of principles of taking and using photographs to tell story effectively. Working knowledge of photography desirable.

8-333. Art Appreciation and Survey (See P. 93)

8-334. Modern Art: Its Sources and Development (See P. 93)

8-336. History of Art in America (See P. 93)

8-011. Photographic Roundtable

Fall, non-credit. Repeated in Spring

ELBRIDGE C. PURDY

Opportunity for continued study of photography. The group meets twice each month during the regular school year. One meeting is devoted to constructive analysis of photographic work presented by members; the other meeting is devoted to presentation of information about new developments and techniques in photography and to other topics of current interest. Annual Salon. Open to the student who has completed any of the courses in photography offered by the Graduate School.

8-165. Photocomposing I—Principles

Fall, 3 credits. Repeated in Spring

W. HOWARD MARTIN

Designed to acquaint the student with fundamentals of good composition and layout, and application of these principles to paste-up of positives, using type from phototype setting equipment and the Fotosetter. Analysis of good and bad composition through study of advertisements, photographs, and illustrations. Instruction in use of drafting equipment and materials in preparation of advertisements, ruled forms, and simple and complex booklets, using photographs, illustrations, and color overlays.

8-166. Photocomposing II—Practice

Fall, 3 credits. Repeated in Spring

HENRY DOMBROWSKI

ROBERT S. WRAY, JR.

Laboratory instruction and practice in fundamentals of basic photographic processes. Preparation of prints and negatives used in the paste-up class, photographing of completed assignments, and opaquing and engraving of final negatives. Stripping of halftone and line negatives, masking, surprinting, and register of negatives.

8-170. Survey of Lithography

Year, 3 credits each semester

DAVID REZNIKOFF

Primarily for the lithographic apprentice or those desiring understanding of whole lithographic process. First semester: Development of lithography. Other printing processes and their relationship to lithography. Offset photography, including color. Plate making. Layout and stripping. Second semester: Press work. Copy preparation. Cold and hot composition and photo typesetting. Lithographic ink making and uses. Offset papers, including visit to mill in Pennsylvania. Binding. Advantages and limitations of process. Future trends. Lectures and field trips.

8-171. Offset Stripping and Negative Work

Year, 3 credits each semester

JOSEPH F. HAMM

Workshop at apprentice level. Film assembly and stripping procedures and techniques as applied to black and white and simple color register work in photolithography. Survey of stripping. Tools for stripping and their use. Basic mathematics. Opaquing and retouching. Cutting and scribing lines. Negative engraving. Stripping inserts and corrections. Ruling pen practice. Masking halftones and tints. Silhouetting halftones. Quality control problems. Preparing the dummy. Making accurate layouts. Signature imposition. Attaching negatives to flats. Complimentary flats for double printing. Color proving for accurate check. Other stripping problems and procedures. *Prerequisite*: Survey of Lithography, or special permission.

8-174. Offset Photography

Year, 3 credits each semester

WILLIAM I. RANKIN

Workshop at apprentice level. Contact and camera line and halftone negatives for photolithography. Darkroom processing. Contact and mechanical screens. Filters and lens formulae. *Prerequisite*: Survey of Lithography, or equivalent.

8-175. Lithographic Estimating

Year, 2 credits each semester

RUSSELL W. CLARK

Analysis and procedures of cost estimating, with emphasis on cost finding and its application to preparing estimates especially in Federal Government. Relationship of estimate to customer and plant. Materials, new products, their use, and how they can reduce costs. Selection of problems and writing up of practice estimates. First semester: Introduction to estimating, basic accounting principles, and development of budgeted hourly costs for a plant. Expenses and how to distribute them. Materials and their storage and handling, offset photography, platemaking, and paper, and its problems. Second semester: Copy preparation, composition, offset press work, and bindery operations. Field trips to both hot metal and cold composition plants, an ink plant, a bindery, and a paper mill. Guest lecturers from lithographic trade.

Courses Offered at the Systems Research and Development Service, Federal Aviation Agency

ADVISORY COMMITTEE

Carl M. Russell, *Chairman*

Albin N. Benson, Henry A. Budde, Hans Giesecke, H. V. Hermansen, Robert K. McKelvey, Joseph J. Scavullo, Edward E. Wood

The Federal Aviation Agency invited the Graduate School to offer courses at its Systems Research and Development Service, Atlantic City, New Jersey, beginning in the spring 1961 semester. These courses are open to all employees of the Federal Government and to other qualified students as facilities permit. Registration can be completed at the Bureau of Research and Development or at the Graduate School.

Languages and Literature

2-450. Technical Writing

Fall, 2 credits. Repeated in Spring

JOHN B. MOULLETTE

Designed to help engineers, technicians, mathematicians, and other technical personnel to improve their research reports. Survey of fundamentals of writing technical report. Its characteristics, parts, functions, as well as steps in preparation, and process of criticism.

Mathematics and Statistics

3-550. Introduction to Digital Computers

Fall, 3 credits. Repeated in Spring

EDWARD A. ROBIN

Designed for the student with minimal background in engineering and mathematics. Broad view of relationships of computer to scientific investigation and business enterprise. Relationships between problem and computer. Examination of structure and organization of computer in connection with large functional units. Their interrelations, interdependence, and control. Some programming concepts.

7-765. Logical Design of Digital Computers

Fall, 3 credits. Repeated in Spring

EDWARD A. ROBIN

Introduction to logical design of digital computer. Number systems and computer components. Boolean algebra and its use in logical design. Combination logic. Sequential or memory circuits. Flow tables and flow graphs. Memory element input equations. Synchronous versus asynchronous synthesis. Logic modules. *Prerequisites:* Working knowledge of algebra. Training at college level in engineering, physical sciences, or mathematics, or equivalent experience.

3-464. Digital Computer Programming

Fall, 3 credits. Repeated in Spring

FREDRICK C. HOLLAND

What a computer is and how it is used. Flow diagramming. Programming IBM 7090 computer. Simple machine decisions. Introduction to magnetic tape input-output. Symbolic assembly program. Looping, indexing, and open and closed subroutines. Arithmetic operations. Floating-point representation of numbers. Program testing. *Prerequisite*: High school algebra, or acquaintance with digital computers.

3-383. Experimental Statistics

Fall, 3 credits. Repeated in Spring

DONALD L. WESTERFIELD

Designed to provide the student with sufficient background and proficiency in statistical methodology to undertake advanced training in Experimental Design or equivalent course. Topics: Scientific method. Statistical analysis. Central tendency. Dispersion, Probability. Sampling. Testing statistical hypotheses. Statistical inference. Analysis of variance. *Prerequisite*: High school algebra.

3-384. Experimental Design

Fall, 3 credits. Repeated in Spring

DONALD L. WESTERFIELD

Nonmathematical course in analysis and interpretation of experimental data. Elementary probability relationships. Common frequency distributions. Concept of sampling error. Tests of significance of differences between averages. Chi-square test as applied to differences between observed and expected frequencies. Regression and correlation. Elementary discussion of analysis of variance and covariance. Basic design principles of experimentation, including randomized blocks, Latin square, incomplete blocks, factorials, and confounding. Laboratory exercises based on typical experimental and evaluation problems encountered at National Aviation Facilities Experimental Center.

Social Sciences

7-225. Human Engineering

Fall, 3 credits

INSTRUCTOR TO BE ANNOUNCED

Experimental methods as applied to problems of visual and auditory presentation of information, work and fatigue, job analysis, man machine allocation of functions, and other areas of interest to psychologists and engineers in research and development. Emphasis on engineering as exhibited in research and development programs at National Aviation Facilities Experimental Center.

Correspondence Program

COMMITTEE

E. J. Peterson, *Chairman*

Mary L. Collings, C. Edwin Davis, Manlio F. De Angelis, Cannon C. Hearne, Charles B. Rauscher, George T. Reeves, Jr., James L. Robinson, James H. Starkey

The following courses are open to qualified field employees of the departments and agencies of the Federal Government and to other qualified students as facilities permit. For additional information and for registration materials, write to the Registrar, Graduate School, U. S. Department of Agriculture, Washington 25, D. C.

10C. Review of Engineering Fundamentals for P. E. Examination

Non-credit (16 lessons)

JOHN H. RIXSE, JR.

General refresher course in basic sciences and engineering principles. Intended to assist in preparation for basic portions of the Professional Engineer's License Examination (Engineers-in-Training). Not specific branches of engineering, but introductory problems for specific branches. Elements of strength of materials. Structures. Fluid mechanics. Mechanical engineering. Electrical engineering. Engineering economics. *Prerequisite:* Preferred, those qualified to take the Professional Engineer's Examination. Cost: \$42 and \$10 for supplies and postage. Text materials are extra.

125C. Basic Lettering

1 credit (7 lessons)

EUGENE MAY

Designed to familiarize the student with the fundamentals of lettering with applications to soil survey charts and maps. Basic strokes, spacing, use of contour pen, and lettering of symbols on aerial photographs. Cost: \$14 and \$6 for supplies and postage. (This does not include the lettering tools.)

130C. Plain Letter Writing

Non-credit (6 lessons)

ELIZABETH D. SECREST

Modern government letter writing techniques by 4-S formula for Shortness, Simplicity, Strength, and Sincerity. Adaptation of "Plain Letters Workshop." Supplemental reading and work assignments. Designed for employees of the Federal Government without access to "Plain Letters Workshop." Emphasis on skills of communication rather than on grammar. Cost: \$14 and \$6 for supplies and postage.

114C. Federal Personnel Procedure

2 credits (16 lessons)

HENRY C. STARNES

Legal, regulatory, and procedural aspects of Federal personnel administration. Designed to broaden technical knowledge of those engaged in personnel work and to inform those in other administrative activities about personnel requirements and activities. Also to acquaint the Federal employee in general concerning laws and regulations governing his status and rights. Study of purpose and place of personnel activities in the Government. Review of basic laws and authorities for personnel action, position classification activities, recruiting, and administrative activities preceding appointment process. Requirements and procedures involved in personnel actions such as appointments, promotions, removals, retirements, reductions in force, and disciplinary actions. Personnel activities

involving minimum of standard regulation, procedure and practice, such as training, incentive awards, employee relations, and employee performance. Cost: \$28 and \$10 for supplies and postage. Text materials are extra.

205C. Modern Supervisory Practice

2 credits (16 lessons)

WILLIAM R. VAN DERSAL
NORMAN A. BERG
JOSEPH B. ROGERS

Designed for supervisors or those desiring to become supervisors. Involves study and application of principles of supervision, supervisory techniques, participation, motivation, communications, organization principles, workload analysis, planning, scheduling, work improvement studies, and solving problem cases. Cost: \$28 and \$10 for supplies and postage. The text is extra.

236C. Report Writing

2 credits (15 lessons)

ROBERT C. REED
WILBERT SCHAAL

Designed to assist field employees of the Federal Government in preparing memoranda and reports. Simple and brief treatment of English composition. Special attention to clear, concise, orderly, and informative presentation. Avoidance of more common faults of expression. Cost: \$28 and \$10 for supplies and postage. The text is extra.

500C. Technical Writing

2 credits (16 lessons)

WARD W. KONKLE

Designed to help scientists, engineers, and economists improve their research reports and journal articles for professional publication. Step-by-step procedure in planning, outlining, and writing first draft. Revising for clarity. Adding professional touch. Presenting data in tabular form. Writing summaries and abstracts. Reviewing and evaluating technical papers. *Prerequisite*: Undergraduate degree in one of sciences, engineering, economics, or other technical field. Cost: \$28 and \$10 for supplies.

316C. Soils and Soil Management

2 credits (15 lessons)

J. GORDON STEELE

Practical aspects of soil management. Physical, chemical, and biological properties of soils. How soils are formed. Soils of different places. How soils are changed by erosion, depletion, and improvement. Management of soils for good production and for their conservation and improvement. *Prerequisite*: High school chemistry, or equivalent. Extra reading necessary for the student without high school chemistry. Physics desirable, but not required. Cost: \$28 and \$10 for supplies and postage. The text is extra.

321C. Farm Forestry

2 credits (15 lessons)

THEODORE B. PLAIR

Growing of wood as a farm crop. Principles of forestry as integrated with the farm business, and as contrasted with commercial forestry. Management of woods on the farm. Development of farm woodland enterprise. Designed to help those who teach agriculture or assist farmers in its practice, professional foresters, and farmers to apply forestry techniques to special problems of growing wood as a farm crop. The student should have access to a farm woods because at least one-third of the lessons requires field work. *Prerequisites*: Two years of college, or practical experience in woods or farm operations as a partial substitute. Cost: \$28 and \$10 for supplies and postage. The text is extra.

325C. Legal Aspects of Investigations—Criminal Evidence and Procedure

2 credits (16 lessons)

JOHN F. DONOGHUE

Designed to provide investigative personnel and those desiring to prepare for such work background and insight into legal aspects of crime investigations. Procedures concerning admission of

evidence. Circumstances and conditions under which evidence is of probative value. Crimes and their elements. Court procedures. Because all investigations are potential sources of prosecution, the requirements of criminal evidence and procedure often reach into the early stages of investigation. Designed to provide understandable information without overemphasis on technical aspects. Cost: \$28 and \$10 for supplies and postage.

362C. Federal Meat Inspection and Animal Quarantine Laws

2 credits (16 lessons)

DONA S. KAHN

History, constitutionality, and provisions of the Federal Meat Inspection Act and related legislation, the Animal Quarantine statutes, and the Poultry Products Inspection Act. The course is intended as an aid to administrative officials. No previous legal training is required. Cost: \$28 and \$10 for supplies and postage.

410C. Safety Program Administration

2 credits (16 lessons)

SETH JACKSON

Practical course aimed to help supervisors and staff at all levels with their accident prevention problems. History and principles of accident prevention. Basic needs of a safety man. How to appraise training needs and maintain interest in safety efforts. Fundamentals of an effective safety program and some "sure-fire" formulas successfully used in industry and Government. Emphasis on prevention through human relations rather than on investigation of accidents. Cost: \$28 and \$10 for supplies. Text materials are extra.

513C. Statistical Methods in Biology and Agriculture

2 credits (15 lessons)

E. L. LE CLERG

Simple variation. Regression and correlation. Analysis of variance and covariance. Chi-square. Multiple and curvilinear correlation. Application to sampling and experimental design. Practical application of methods. *Prerequisite*: Facility in use of arithmetic and understanding of algebra. Cost: \$28 and \$10 for supplies and postage. The text is extra.

515C. Statistics of Biological Assay

1 credit (6 lessons)

F. M. WADLEY

Introduction to specialized methods that have been developed for both graded and all-or-none responses. Estimates of potency, comparisons of materials, variances, and other phases. *Prerequisite*: Facility in regression study and analysis of variance, such as taught in Statistical Methods in Biology and Agriculture. Cost: \$14 and \$6.00 for supplies and postage.

521C. Experimental Design

2 credits (16 lessons)

F. M. WADLEY

Basic concepts, practice in applying them, and acquaintance with literature opening the way to further study. Philosophy and fundamentals, with some attention to elementary sampling principles. Simpler practical designs, use and analysis of results. Factorial design, confounding, and more complex experiments including incomplete block designs. *Prerequisite*: Genuine practical interest in experimentation and some facility in statistical calculations, including analysis of variance. Cost: \$28 and \$10 for supplies. The text is extra.

533C. Hydrology I

3 credits (16 lessons)

DONALD R. BAKER

Review of elementary hydraulic principles basic to study of flow in natural channels. Phenomena of meteorology that control climate. Methods of collecting data essential to hydrology. Physical characteristics of the land that control the disposition and movement of the earth's water. *Prerequisites*: Physics and algebra. Elementary meteorology, statistics, and engineering desirable, but not required. Cost: \$42 and \$10 for supplies and postage. The text is extra.

534C. Hydrology II

3 credits (16 lessons)

DONALD R. BAKER

Tools used by the hydrologist and application of these tools to specific problems. Hydrograph analysis, runoff relations, runoff distribution, waves, and streamflow routing. Special techniques required in design of projects. Design and operation of water control works. Small basin problems. River forecasting. *Prerequisite*: Hydrology I, or equivalent. Cost: \$42 and \$10 for supplies and postage. The text used in Hydrology I is also used in this course.

580C. History of American Agriculture

3 credits (16 lessons)

WAYNE D. RASMUSSEN

Development of American agriculture from colonial settlement to the present, treated on a chronological basis. Designed to give an historical background for understanding present-day agricultural problems. Two major technological revolutions in American agriculture. Department of Agriculture. Land Grant Colleges. Application of science and technology to farming. Government policies affecting agriculture. Cost: \$42 and \$10 for supplies and postage. The text is extra.

700C. Directed Change in Contemporary Cultures

2 credits (16 lessons)

M. L. WILSON and THELMA A. DREIS

Designed mainly for those engaged in international and national programs in the field of technological assistance. Emphasis on underlying principles in social change and their application to institutional arrangements in different countries for bringing about extension education and community development. Non-Western cultures. Learning process. Training of leaders. Human relations. Although the point of view is the total culture and economy of a country, emphasis is placed on rural aspects and village development, with some consideration of urban problems. Cost: \$28 and \$10 for supplies and postage. Text materials are extra.

Special Program in Meteorology

The following is a special in-service training program in meteorological analysis and prediction offered in cooperation with the United States Weather Bureau. The program is under the general direction of Albert V. Carlin, Chief of Training, United States Weather Bureau, Department of Commerce.

535C. Modern Methods of Meteorological Analysis and Prediction

4 credits (8 lessons)

JAY S. WINSTON and ASSOCIATES

Advanced course designed to provide the practicing field meteorologist with better understanding of some of the techniques and concepts important in present-day forecasting. Hemispheric synoptic map analysis. Predicting motion and development of waves in the westerlies. Numerical weather prediction. Large scale-vertical motion and divergence. Isentropic analysis. Jet stream. Statistical prediction methods. Forecasting tornadoes and severe thunderstorms. Reading assignments covering each of these topics from recent articles and books. Extensive laboratory exercise as part of each lesson, illustrating the particular topic by practical analysis of, or computation from, typical synoptic cases. *Prerequisites*: Basic knowledge of synoptic and dynamic meteorology and weather forecasting.

540C. Extended-Range Forecasting

3 credits (5 lessons)

JAY S. WINSTON and ASSOCIATES

Advanced course intended to familiarize the practicing field meteorologist with behavior of atmospheric circulation and weather over longer periods and with methods employed by the Extended Forecast Section of the Weather Bureau to predict circulation and weather for periods of five and

30 days. Laboratory exercises illustrating long period development and application of forecasting methods to specific cases. *Prerequisite*: Modern Methods of Meteorological Analysis and Prediction, or equivalent.

Special Program in REA Accounting

Three correspondence courses designed for Borrowers' personnel of the Rural Electrification Administration are available. The basic accounting course is also suitable for students other than REA personnel who want to learn the elementary principles of accounting.

100C. Basic Accounting

Non-credit (12 lessons)

HOWARD C. PAINE, JOHN W. SCOTT, and ASSOCIATES

Introduction to accounting for those who have need of some knowledge of accounting, as taxpayers, as employees having certain accounting duties, as managers or directors of a business, or as students embarking on a program of studies including ultimately more specialized accounting. Basic definitions and principles through journalizing, posting, general and subsidiary records, adjustments and accruals, and depreciation to financial statements and ratios, and closing of the books. Thorough grounding in basic accounting theory and its practical application. Cost: \$28 and \$10 for supplies and postage.

200C. REA Borrower Accounting (Electric)

Non-credit (12 lessons)

JOHN W. SCOTT and ASSOCIATES

Designed primarily to train those who are now, or intend to be, office managers, accountants, or bookkeepers in offices of electric utility cooperatives financed by the Rural Electrification Administration. Also useful for employees and directors and managers of REA-financed cooperatives and certified public accountants, attorneys, and engineers engaged by them. Discussion of accounts and accounting records used through construction accounting procedure. Methods of opening, maintaining, and closing books. Financial and statistical reports and their analysis. Technical aspects of REA electric-borrower accounting. Continuing property records. Budgeting. Requesting, accounting for, and repaying REA loan funds. Working knowledge of accounting basic to electric utility industry. Unique accounting requirements arising from method of financing REA borrowers and nonprofit nature of those borrowers organized as cooperatives. Revised to include system of accounts as of January 1961. The Administrator of the Rural Electrification Administration awards a Certificate of Proficiency to the student who satisfactorily completes the course. *Prerequisite*: Basic Accounting, or equivalent, or one year of experience in an REA borrower's office as bookkeeper or assistant bookkeeper. Cost: \$42 and \$10 for supplies and postage.

300C. REA Borrower Accounting (Telephone)

Non-credit (12 lessons)

HOWARD C. PAINE and ASSOCIATES

Designed to provide training for present or prospective bookkeepers and accountants employed by telephone utilities that are borrowers from the Rural Electrification Administration. Also to provide information on telephone utility accounting to directors, managers, and others concerned with the activities of these borrowers. Recommended books of account and basic accounting systems applicable generally to the telephone industry. Accounting to be performed during the periods of organization, construction, and operations. Requesting and accounting for REA loan funds. Computation of interest on, and repayment of, REA loan obligations. Recommended plant accounting procedures through construction and retirement work order procedures. Through successful completion of this course, the student should acquire overall understanding of accounting systems applicable to the telephone industry and working knowledge of specific procedures unique to telephone utilities financed by REA. The Administrator of the Rural Electrification Administration awards a Certificate of Proficiency to the student who satisfactorily completes the course. *Prerequisite*: Basic Accounting, or equivalent, or one year's experience as bookkeeper or assistant bookkeeper in the office of a telephone company or cooperative. Cost: \$42 and \$10 for supplies and postage.

Faculty

FACULTY, DEPARTMENTAL, AND SPECIAL COMMITTEES

The year following the name represents the first year of association with the Graduate School

- ABEL, MARTIN E., (1962). Ph.D., Minnesota. Analytical Statistician, Economic and Statistical Analysis Division, Economic Research Service, USDA. Taught at Minnesota. (Mathematics and Statistics)
- ABERNATHY, FRANK R., (1963). Contract Specialist, Procurement and Contract Management Division, Office of Plant and Operations, USDA. (Public Administration)
- ABRAMOWITZ, BENJAMIN, (1961). Master Artist. (Technology)
- ACKER, LAURENCE W., (1948). Tyler Commercial College. Deputy Comptroller for Accounting and Finance, Office of Assistant Secretary of Defense (Compt.). C.P.A. Taught at American and Columbus School of Accounting. (Public Administration)
- ADELSON, SADYE F., (1949). M.A., California. Chief, Food Consumption Branch, Consumer and Food Economics Research Division, Agricultural Research Service, USDA. (Technology)
- ADOFF, JOAN G., (1963). B.A., Hunter. Systems Engineer, International Business Machines. (Mathematics and Statistics)
- ALEXANDER, BENJAMIN H., (1961). Ph.D., Georgetown. Research Chemist, Department of Immunology, Walter Reed Army Institute of Research, Walter Reed Army Medical Center. Taught at American and Kobe (Japan). (Physical Sciences)
- ALLIN, BUSHROD W., (1939). Ph.D., Wisconsin. Chairman, Outlook and Situation Board, Economic Research Service, USDA. Taught at Wisconsin. (Social Sciences)
- ALLISON, LOWELL E., (1959). Ph.D., Illinois. Soil Scientist, U. S. Salinity Laboratory, Agricultural Research Service, USDA. (Biological Sciences)
- APPLEMAN, PAUL L., (1946). Occupational Specialist, Bureau of Programs and Standards, Civil Service Commission. (Public Administration)
- ARASTEH, REZA, (1963). Ph.D., Louisiana State. Author and Independent Researcher. Taught at Princeton and Tehran. (Languages and Literature)
- ARMBRECHT, BERNARD H., (1962). Ph.D., Georgetown. Research Biochemist, Division of Pharmacology, Food and Drug Administration, Department of Health, Education, and Welfare. (Physical Sciences)
- ARMSTRONG, WILLIAM J., (1963). Chief, Office of Financial Management, Bureau of the Budget. (Public Administration)
- ARNOLD, OLGA MOORE, (1954). B.A., Wyoming. Information Specialist, U. S. Information Agency. (Languages and Literature)
- ARNY, SAMUEL A., (1961). M.S., Tulane. Biological Oceanographer, Biology Section, U. S. Naval Oceanographic Office, Department of the Navy. Taught at Louisiana State and Tulane. (Physical Sciences)
- ARTNA, AGDA, (1962). Ph.D., McMaster University (Canada). Physicist, Nuclear Data Project, National Academy of Sciences, National Research Council. (Physical Sciences)
- ASKEGAARD, DAVID, (1950). B.S., North Dakota. Chief, Program Analysis Branch, Rural Electrification Administration, USDA. (Technology)
- BACHMAN, KENNETH L., (1950). Ph.D., Harvard. Director, Development and Trade Analysis Division, Economic Research Service, USDA. (Social Sciences)
- BAHN, CATHERINE I., (1953). M.A., Columbia. Head, Acquisitions Section, Map Division, Library of Congress. (Languages and Literature)
- BAILY, S. O., (1960). M.S., Iowa State. Electronic Engineer (Instrumentation) Naval Research Laboratory, Department of the Navy. Taught at West Virginia. (Physical Sciences)
- BAKER, DONALD R., (1958). B.S., Kansas. Assistant Chief, Hydrologic Investigations Section, U. S. Weather Bureau, Department of Commerce. (Correspondence)
- BAKER, GLADYS L., (1945). Ph.D., Chicago. Agricultural Historian, Agricultural Marketing Service, USDA. (Public Administration)
- BALDAUF, TONY M., (1951). Assistant Director, Procurement and Property Management Division, Office of Plant and Operations, USDA. (Office Techniques and Public Administration)
- BALLARD, J. VERNON, (1961). B.S., Georgetown, C.P.A. Chief, Division of Case Review and Enforcement Policy, Office of Welfare and Pension Plans, Department of Labor. (Public Administration)
- BAMFORD, RONALD, (1949). Ph.D., Columbia. Dean, Graduate School, University of Maryland. (Biological Sciences)
- BANKO, WINSTON E., (1962). B.S. Oregon State. Chief, Section of Wildlife Management, Branch of Wildlife Refuges, Bureau of Sports Fisheries and Wildlife, Department of the Interior. (Biological Sciences)
- BARGIN, GERMAINE, (1953). Diplômée Université de Paris and de l'Institut d'Amerique Latine de Mexico. Taught at Catholic, Georgetown, and Yucatan. (Languages and Literature)
- BARKER, H. KENNETH, (1961). Ph.D., Michigan. Associate Executive Secretary, American Association of Colleges for Teacher Education. (Committee on Instructional Improvement)
- BARLOW, SHIRLEY, (1959). B.A., George Washington. Internal Audit Staff. Office of the Administrator, Federal Extension Service, USDA. (Office Techniques)
- BARTLETT, RICHARD P., JR., (1957). M.S., Virginia. Polytechnic Institute. Statistician, Agricultural Marketing Service, USDA. (Mathematics and Statistics)
- BASILE, ANTHONY S., (1961). B.C.E., George Washington. Head, Technical Section, U. S. Naval Oceanographic Office, Department of the Navy. (Technology)
- BATCHELDER, ESTHER L., (1960). Ph.D., Columbia. Director, Clothing and Housing Research Division, Agricultural Research Service, USDA. Taught at Arizona, Columbia, Rhode Island, and Washington State. (Agricultural Research Center Committee)
- BAUER, CARL F., (1955). B.A., St. John's. Lecturer, School of Nursing Education, Catholic University, Maryknoll Seminary, and Maryknoll Teachers College, Ossining, New York. (Social Sciences)
- BAUER, MAGNA E., (1942). Rome, Italy, and Auguste Victoria Lyzeum, Berlin. Historian, Office of the Chief of Military History, Department of the Army. (Languages and Literature)
- BEACHAM, LOWRIE M., (1950). B.S., South Carolina. Deputy Director, Division of Food, Food and Drug Administration, Department of Health, Education, and Welfare. Taught at South Carolina. (Physical Sciences)
- BEAR, N. ROBERT, (1948). B.S., Ohio State. Assistant to Director of Personnel, Inspection Coordination and Defense Planning, USDA. Taught at Michigan State and Ohio State. (Public Administration)
- BEATY, LAYNE R., (1957). Chief, Radio and Television Service, Office of Information, USDA. (Committee on Information)
- BELL, E. DONALD, (1951). Assistant to Director of Labor Relations, Southern Railway System. (Office Techniques)
- BENSON, BRUCE W., (1962). Research Engineer, Research Operations, Inc. Taught at Georgia Institute of Technology. (Mathematics and Statistics)
- BENSON, WILLIAM E., (1960). Ph.D., Yale. Head, Earth Sciences Section, National Science Foundation. (Physical Sciences)

- BERG, NORMAN A., (1962). M.P.A., Harvard. Assistant to the Administrator, Soil Conservation Service, USDA. (Office Techniques and Correspondence)
- BEST, SALLY D., (1961). B.S., Kansas. Taught at Kansas City (Kansas) Public Schools. (Languages and Literature)
- BLASKY, HAROLD F., (1960). LL.B., Harvard. Deputy General Counsel, Corps of Engineers, Department of the Army. (Public Administration)
- BOLDYREFF, TATIANA W., (1962). M.S. in L.S., Catholic. M.A. (Languages) Battle Creek. Translator, Naval Medical School, National Naval Medical Center, Department of the Navy. Taught at Battle Creek and Pennsylvania College for Women. (Languages and Literature)
- BOLLO, LOUISE ESPEY, (1952). B.A., George Washington. Nosologist, Public Health Service, Department of Health, Education, and Welfare. (Biological Sciences)
- BONDI, VICTOR L., (1961). Rome Law School. Professor of Italian, U. S. Naval Postgraduate School, Department of the Navy. Taught at U. S. Naval Intelligence School. (Languages and Literature)
- BOTTS, RALPH R., (1946). B.S., Florida. Leader, Agricultural Risks and Insurance Investigation, Farm Production Economics Division, Economic Research Service, USDA. (Public Administration)
- BOYD, LUCILE N., (1954). Employee Development Officer, Internal Revenue Service, Department of the Treasury. (Office Techniques)
- BREIMYER, HAROLD F., (1956). Ph.D., American. Staff Economist, Agricultural Marketing Service, USDA. (Social Sciences)
- BRETT, CARLTON E., (1961). M.A., Middlebury. Technical Editor, Technical Services Division, U. S. Naval Engineering Experiment Station, Annapolis, Maryland. Taught at George Washington. (Languages and Literature)
- BREWSTER, JOHN M., (1949). Ph.D., Columbia. Agricultural Economist, Agricultural Research Service, USDA. Taught at Columbia. (Social Sciences)
- BRIGGS, SHIRLEY A., (1962). M.A., State University of Iowa. Vice President for Publications and Editor, Audubon Naturalist Society of the Central Atlantic States, Inc. Taught at North Dakota State. (Biological Sciences)
- BROWN, PHILIP, (1956). B.A., Niagara. Director, Information, Farmers Home Administration, USDA. (Committee on Information)
- BUBECK, A. ERIC, (1962). M.A., Pennsylvania. Chief, Regional Training Branch, Federal Aviation Agency. Taught at Muhlenberg. (Special Program)
- BUCCI, D. A., (1959). B.S.E., George Washington. Assistant Chief, Department of Cartography, Army Map Service, Department of the Army. (Technology)
- BUCHANAN, LEE K., (1962). M.D., Iowa. Health, Safety, and Welfare, Office of Personnel, USDA. (Social Sciences)
- BUCK, LEWIS A., (1961). M.A., William and Mary. Director of Field School Studies, Audubon Naturalist Society of the Central Atlantic States, Inc. (Biological Sciences)
- BUCK, GEORGIA A., (1962). B.A., Illinois Wesleyan. Member, Board, Audubon Naturalist Society of the Central Atlantic States, Inc. (Biological Sciences)
- BUCKLEY, JOHN L., (1961). Ph.D., State College of Forestry, University of New York. Director, Patuxent Wildlife Research Center, Bureau of Sport Fisheries and Wildlife, Department of the Interior. Taught at Alaska. (Biological Sciences)
- BUDDE, HENRY A., (1961). B.S., North Texas State College. Chief, Employee Services and Development Section, Systems Research and Development Service, Federal Aviation Agency. Taught at Amarillo (Texas) Public Schools. (FAA)
- BURKHART, M. D., (1955). M.S., Pennsylvania State. Meteorologist, U. S. Naval Oceanographic Office, Department of the Navy. (Physical Sciences)
- BURNETT, HARRY L., JR., (1956). In charge of Photographic Services, Office of Architect of the Capitol. (Technology)
- BURNS, ROBERT E., (1962). Ph.D., Washington, Oceanographer, Research and Development, U. S. Coast and Geodetic Survey, Department of Commerce. Taught at Bucknell and Washington. (Physical Sciences)
- BUTLER, FRANCES A., (1952). Director of Secretarial School, Emerson Institute. Taught at Temple Secretarial School. (Office Techniques)
- BUTLER, K. A., (1949). B.S., Minnesota. Director, Internal Audit, Agricultural Research Service, USDA. (Public Administration)
- CALDWELL, JOHN C., JR., (1960). B.A., Georgia. Taught at Georgia. (Special Program)
- CAMPBELL, WILLIAM J., (1961). Ph.D., Ohio State. Chief, Department of Biological Chemistry, Walter Reed Army Institute of Research, Walter Reed Army Medical Center. Taught at American. (Physical Sciences)
- CARLETON, WALTER M., (1961). Ph.D., Michigan State. Associate Director, Agricultural Engineering Research Division, Agricultural Research Service, USDA. Taught at Iowa State, Kansas State, and Michigan State. (Technology)
- CARLIN, ALBERT V., (1951). B.S., Boston, Chief of Training Section, U. S. Weather Bureau, Department of Commerce. (Physical Sciences and Correspondence)
- CARLSON, THEODORA E., (1952). B.A., Nebraska. Chief Periodicals Section, Office of Education, Department of Health, Education, and Welfare. (Committee on Publications)
- CARROLL, ELIZABETH T., (1962). USDA-FAS-Barter and Stockpiling. (Office Techniques)
- CARTER, PAUL S., (1955). M.B.A., Northwestern. C.P.A. Assistant Director, Accounting and Finance Policy, Office of Secretary of Defense, Department of Defense. (Public Administration)
- CARTER, ROY A., (1963). B.M. in E., Howard. Technical Writer, Research and Development, Federal Government. (Languages and Literature)
- CAVIN, JAMES P., (1938). Ph.D., Harvard. Deputy Director, Economic and Statistical Analysis Division, Economic Research Service, USDA. Taught at Catholic and Puerto Rico. (Social Sciences)
- CERINE, WILHELMINA M., (1957). B.S., Teachers College, Columbia. Employee Development Officer, Department of Labor. Taught at Naval Research Laboratory and Public Schools, New Jersey and Pennsylvania. (Office Techniques)
- CHAPMAN, GORDON R., (1963). M.A., Oklahoma. Economist, Office of Manpower Productivity and Industrial Hazards, Division of Technological Studies, Bureau of Labor Statistics, Department of Labor. (Social Sciences)
- CHRISTENSEN, RAYMOND P., (1959). Ph.D., Wisconsin. Agricultural Economist, Chief, Economic Development Branch, Development and Trade Analysis Division, Economic Research Service, USDA. (Social Sciences)
- CHURCHILL, ETHAN D., (1950). Ph.D., Catholic. Botanist, U. S. Geological Survey, Department of the Interior. Lecturer in Ecology, Catholic University. (Technology)
- CLARK, EARL F., (1962). B.E.E., Minnesota. Electrical Engineer—General, Power Plant Branch, Rural Electrification Administration, USDA. (Mathematics and Statistics)
- CLARK, RUSSELL W., (1959). M.B.A., Southeastern. Printing Production Specialist. (Technology)
- CLAWSON, MARION, (1962). Ph.D., Harvard. Director, Land Use and Management Program, Resources for the Future, Inc. (Social Sciences)
- CLEWLOW, CARL W., (1962). M.A., George Washington. Arthur Young and Company, New York and Washington. Taught at American, Florida State, George Washington, Pittsburgh, and Syracuse. (Special Program)
- COBB, EDWARD S., (1947). Head, Specifications and Test Division, U. S. Naval Photographic Center. (Technology)
- COGGESHALL, WALDEN, (1959). B.S., South Carolina Assistant Director, Division of Management Research, Office of the Secretary, Department of Interior. (Public Administration)
- COLBERT, ROY V., (1961). B.A., Arizona State. Director, Training and Development, Post Office Department. (Public Administration)
- COLLINGS, MARY L., (1952). D.Ed., George Washington. Staff Development Specialist, Extension Research and Training, Federal Extension Service, USDA. (Committee on Correspondence Study and Extension Education)
- COMPTON, LAWRENCE V., (1952). M.A., California. Head Biologist, Plant Technology Division, Soil Conservation Service, USDA. (Biological Sciences)

- COOK, CHARLES E., (1959). B.A., Washington. Cartographer, Photogrammetry Division, U. S. Coast and Geodetic Survey, Department of Commerce. Taught at Coast and Geodetic Survey. (Technology)
- COOK, LEROY, L., JR., (1962). B.A., Albion. Supervisory Digital Computer Systems Analyst, Public Health Service, Department of Health, Education, and Welfare. (Mathematics and Statistics)
- COOK, RICHARD F., (1955). B.A., National, C.P.A. Management Consultant. Taught at Catholic and Strayer. (Public Administration)
- COOPER, DENIS A., (1961). Licentiat in Drept., Cernautu (Rumania). Ph.D., Cluj (Rumania). J.D., George Washington. Lieutenant Colonel, U. S. Air Force. *Retired*. Industrial Specialist, Small Business Administration. Taught at Volkshochschule, Wiesbaden (Germany). (Public Administration)
- COOPER, JOHN C., JR., (1946). B.A., Furman. Director, Office of Management Appraisal and Systems Development, USDA. (Public Administration)
- CORNSEWET, ALBERT C., (1947). Ph.D., North Carolina. Chief, Psychology Service, Mental Hygiene Clinic, Veterans Benefits Office, Veterans Administration. Clinical Consultant in Training in Psychology at Catholic. Taught at Brown, Catholic, and North Carolina. (Social Sciences)
- CRESWELL, THOMAS J., (1962). B.S. in E., George Washington. Agency Safety Engineer, Office of Personnel and Training, Federal Aviation Agency. (Public Administration)
- CULLINANE, JOHN J., (1959). B.E.E., Catholic. Electronic Engineer, Harry Diamond Laboratory. (Technology)
- CUNNINGHAM, JOSEPH F., (1961). Associate Director, Data Automation, U. S. Air Force. Adjunct Professor, School of Government and Public Administration, The American University. (Special Program)
- CUNNINGHAM, VIRGINIA, (1960). B.A. and Certificate in Library Science, Wisconsin. Head, Music Section, Descriptive Cataloging Division, Library of Congress. (Languages and Literature)
- CUPOLI, JAMES V., (1959). Artist and Art Teacher. Taught at Corcoran and Columbia Technology Schools of Art. (Technology)
- CURTIS, JOHN M., (1962). Ph.D., Maryland. Professor and Head, Department of Agricultural Economics, College of Agriculture, University of Maryland. Taught at Maryland and North Carolina State. (Social Sciences)
- CZAJKOWSKI, ANTHONY F., (1960). Ph.D., Fordham. Administrative Officer, United States Government. Taught at Fordham, George Washington, and St. Louis. (Social Sciences)
- DALY, JOSEPH F., (1941). Ph.D., Princeton. Chief Mathematical Statistician, Bureau of the Census, Department of Commerce. Taught at Catholic, Princeton, and Stanford. (Mathematics and Statistics)
- DAVIDSON, ALFRED J., (1962). B.A., Columbia. Public Health Administrator, Malaria Eradication Branch, Agency for International Development, Department of State. (Public Administration)
- DAVIDSON, EUGENE J., (1962). J.D., New York. Assistant General Counsel, Legislative, Procurement, and Administrative Division, Small Business Administration. (Public Administration)
- DAVIS, C. EDWIN, (1954). M.A., Texas. Assistant Director, Personnel Division, Farmers Home Administration, USDA. (Committee on Correspondence Study and Extension Education)
- DAVIS, RAYMOND, (1946). Consultant, Optics and Metrology Division, National Bureau of Standards, Department of Commerce. *Retired*. (Technology)
- DE ANGELIS, MANLIO F., (1957). M.S., Syracuse. Deputy Assistant Administrator for Management, Bureau for Africa and Europe, Agency for International Development, Department of State. Taught at Bologna (Italy), California, and Florida State. (Public Administration)
- DE CATUR, LOUIS A., (1962). M.A., Maryland. Instructor, University of Maryland. Taught at Northwestern and Montgomery Blair High Schools. (Languages and Literature)
- DEES, BOWEN C., (1959). Ph.D., New York. Assistant Director for Scientific Personnel and Education, National Science Foundation. Taught at Massachusetts Institute of Technology, Mississippi College, New York, and Rensselaer Polytechnic. (Physical Sciences)
- de la ROSA, O. A., (1953). M.S., Catholic. Chief Architect, Bureau of Yards and Docks, Department of the Navy. (Technology)
- DEXTER, WAYNE V., (1950). B.S., Kansas State. Chief, Division of Information, Office of Management Services, USDA. (Committee on Information)
- DIAMOND, ANTHONY T., (1962). M.S., Cornell. Aerospace Technologist, Office of Man Space Flight, Launch Vehicles and Propulsion, National Aeronautics and Space Administration. (Mathematics and Statistics)
- DINSMORE, WILLIAM S., (1962). M.A., American. Chief, Federal Supply Programs Branch, Systems and Procedures Division, General Services Administration. (Public Administration)
- DIX, WALTER S., (1952). Civil Engineer, Tennessee Valley Authority. (Technology)
- DOLAN, MARIE A., (1959). M.A., American. Feature Writer, International Press Service, Far East, U. S. Information Agency. (Languages and Literature)
- DOMBROWSKI, HENRY M., (1957). Photomechanical Supervisor, Soil Conservation Service, USDA. (Technology)
- DOMINICK, HOWARD B., (1957). B.S., Clemson; Diploma, Fontainebleau School of Fine Arts (France). Assistant Chief, Design Management Staff, Office of Design and Construction, Public Buildings Service, General Services Administration. (Technology)
- DONOGHUE, JOHN F., (1959). LL.B., George Washington. Attorney Adviser, Office of the General Counsel, USDA. (Correspondence)
- DONOVAN, HENRY A., (1941). Deputy Executive Assistant Administrator for Management, Agricultural Research Service, USDA. *Retired*. (Office Techniques)
- DOUGLASS, RAYMOND C., (1957). Ph.D., Stanford. Geologist, U. S. Geological Survey, Department of the Interior. Taught at American, Chile (South America), and Stanford. (Physical Sciences)
- DOW, ILDA, (1961). Sioux Falls. Office of Chief of Ordnance, Department of the Army. Taught at Emerson Institute. (Office Techniques)
- DOWNNEY, MYLO S., (1961). M.A., Maryland. Director, Four-H and Youth Development, Federal Extension Service, USDA. (Social Sciences)
- DRAHEIM, E. R., (1942). Ph.D., Cornell. Chief, Employee Development Division, Office of Personnel, USDA. Taught at Cornell, Minnesota, and South Dakota State. (Public Administration)
- DREIS, THELMA A., (1952). Ph.D., American. Evaluation Specialist, Foreign Training Division, Foreign Agricultural Service, USDA. (Correspondence)
- DUNN, CARLOS R., (1957). M.S., Chicago. Meteorologist, U. S. Weather Bureau, Department of Commerce. (Physical Sciences)
- DUNN, RONALD J., (1963). B.C.S., Columbus. Program Director, Army Audit Agency. U. S. Army. (Public Administration)
- DURBIN, CHARLES G., (1960). V.M.D., Pennsylvania. Veterinary Medical Director, Food and Drug Administration, Department of Health, Education, and Welfare. (Biological Sciences)
- DWYER, EDMUND D., (1957). LL.B., Georgetown. Chief, Navy Management Office, Department of the Navy. (Public Administration)
- EAGLE, ROBERT H., (1961). B.S., North Carolina. Material Functions Evaluation Specialist, Federal Aviation Agency. (Public Administration)
- EDWARDS, CLARK, (1963). Ph.D., Michigan State. Head, Demand Analysis Section, Economic Research Service, USDA. Taught at Oklahoma State. (Social Sciences)
- EDWARDS, GENIANA R., (1950). M.A., George Washington. Supervisory Publications Editor, Economic Research Service, USDA. (Languages and Literature)
- ELDRIDGE, FRANK R., (1959). Author. Taught at Columbia, Georgetown, George Washington, and New York. (Social Sciences)
- ELLENBERGER, JACK S., (1963). M.S. in L.S., Columbia. Librarian, Covington and Burling, Washington, D. C. (Languages and Literature)
- ELLER, JEROME N., (1953). B.A., St. John's. Administrative Assistant to Senator Eugene J. McCarthy of Minnesota. (Public Administration)
- ELLINGWOOD, CECIL, (1957). B.S., New Hampshire. Geodesist, U. S. Coast and Geodetic Survey, Department of Commerce. (Technology)

- ELLIS, N. R., (1952). M.S., Wisconsin. Associate Director, Animal Husbandry Research Division, Agricultural Research Service, USDA. (Agricultural Research Center Committee and Biological Sciences)
- ENNEIS, JAMES M., (1957). M.S., Georgia. Supervisory Psychodramatist, St. Elizabeths Hospital, Department of Health, Education, and Welfare. Taught at Georgia. (Committee on Instructional Improvement and Public Administration)
- ESTEN, RANDALL D., (1952). M.S., Syracuse. Chief, Photogrammetry Division, U. S. Army Engineer Geodesy, Intelligence, and Mapping Research and Development Agency, Department of the Army. Taught at Syracuse. (Technology)
- EVANS, W. DUANE, (1941). B.S., Clarkson College of Technology. Associate Commissioner, Bureau of Labor Statistics, Department of Labor. (Mathematics and Statistics)
- EVERETT, GEORGE H., (1946). C.E., Clarkson College of Technology. Civil Engineer, U. S. Coast and Geodetic Survey, Department of Commerce. Taught at American Institute (Bolivia). (Technology)
- EYSENBURG, MAURICE H., (1956). Art Institute of Chicago. Illustrator, Department of State. Taught at Abbott Art School and Chicago. (Technology)
- FARR, MARIE L., (1963). Ph.D., State University of Iowa. Mycologist, Mycology Investigations, Crops Protection Research Branch, Crops Research Division, Agricultural Research Service, USDA. (Languages and Literature)
- FEDJAY, VICTOR A., (1960). Ph.D., University of Warsaw (Poland). Senior Analyst and Group Supervisor, Reference Department, Library of Congress. (Languages and Literature)
- FEINSTEIN, LOUIS, (1962). Ph.D., Georgetown. Assistant Branch Chief, Field Crops and Animal Products Branch, Market Quality Research Division, Agricultural Marketing Service, USDA. Taught at Pennsylvania. (Physical Sciences)
- FELDMAN, DENNIS S., (1956). B.A., New York. Chief, Publications Division, Office of Information Services, Federal Aviation Agency. (Languages and Literature)
- FERRARE, GEORGE D., (1959). B.S., Michigan State. Director, Division of Administrative Services, Forest Service, USDA. (Public Administration)
- FEY, CURT F., (1962). Ph.D., Pennsylvania. Mathematician, Management Sciences Department, Washington Systems Center, Federal Systems Division, International Business Machines. (Mathematics and Statistics)
- FINDLAY, JOSEPH P., (1947). B.A., George Washington. Chief, Division of Personnel, Office of Management Services, USDA. (Public Administration)
- FINLATOR, JOHN H., (1959). B.A., North Carolina State. Director, Manpower Resources, General Services Administration. Taught at Raleigh, North Carolina, Public Schools. (Public Administration)
- FISHER, JOSEPH L., (1962). Ph.D., Harvard. President, Resources for the Future, Inc. Taught at Allegheny, Colorado, and Harvard. (Social Sciences)
- FITTON, H. NELSON, JR., (1962). M.A. George Washington. Chief, Editorial Branch, Publications Division, Office of Information, USDA. (Languages and Literature)
- FITZPATRICK, RICHARD S., (1947). Ph.D., American. Chief, Reports Branch, Agency Library, Research and Reference Service, U. S. Information Agency. Taught at American. (Social Sciences)
- FLAVIN, THOMAS J., (1946). LL.B., Georgetown. Judicial Officer, Office of the Secretary, USDA. Taught at Georgetown. (Public Administration)
- FLORY, EVAN L., (1954). Ph.D., Nebraska. Chief, Branch of Land Operations, Bureau of Indian Affairs, Department of the Interior. (Technology)
- FONDREN, JAMES P., (1954). B.S.C.E., Arkansas. Cartographer, Soil Conservation Service, USDA. (Technology)
- FONFARA, EDWARD W., (1950). Cartographer, U. S. Naval Oceanographic Office, Department of the Navy. (Technology)
- FORTE, RUSSELL T., (1963). Visual Information Specialist, Photography Division, Office of Information, USDA. (Technology)
- FOSTER, ALBERT B., (1962). B.S., Missouri. Chief, Program Services Branch, Information Division, Soil Conservation Service, USDA. (Biological Sciences)
- FOSTER, JACK H., (1958). M.A., Michigan. Director of Personnel, Arlington County, Virginia. (Public Administration)
- FOSTER, WILLIAM A., (1955). M.S., University of the State of New York. Head, Bathymetry Section, U. S. Naval Oceanographic Office, Department of the Navy. (Technology)
- FOTHERGILL, LE ROY, (1958). M.D., Harvard. Scientific Adviser, U. S. Army Biological Laboratories, Fort Detrick, Frederick, Maryland. Taught at Harvard Medical and Naval Medical. (Biological Sciences)
- FREDERICK, EUGENE W., (1962). Illustrator, Graphic Arts Branch, Office of the Comptroller, Department of the Army. (Technology)
- FRETTS, CARL A., (1946). B.S., Pittsburgh. C.P.A., Assistant Manager, Federal Crop Insurance Corporation, USDA. Retired. Taught at Pittsburgh. (Committee on Internal Audit)
- FRIEDMAN, S. J., (1955). B.S., George Washington. Executive Vice President, O.M.I. Corporation of America, Alexandria, Virginia. (Technology)
- FRIEDMAN, WILLIAM (1956). B.S., Queens. Plant Quarantine Inspector (Training-Nematology), Division Training Center, Plant Quarantine Division Agricultural Research Service, USDA. (Biological Sciences)
- FRITZ, SIGMUND, (1953). Sc.D., Massachusetts Institute of Technology. Chief, Meteorological Satellite Laboratories, U. S. Weather Bureau, Department of Commerce. (Physical Sciences)
- FUCHS, ROBERT H., (1949). B.A., American. Accountant. (Office Techniques and Public Administration)
- GAMBINO, LAWRENCE A., (1962). B.A., Syracuse. Mathematician, GIMRADA, Fort Belvoir, Virginia. (Mathematics and Statistics)
- GANTT, PAUL H., (1958). J.U.D., Vienna; B.C.L., William and Mary. Chairman, Board of Contract Appeals, and Assistant Solicitor, Branch of Claims and Contract Appeals, Department of the Interior. Taught at William and Mary. (Public Administration)
- GARDNER, KELSEY B., (1956). M.B.A., Harvard. Consultant on Farmer Cooperatives and formerly Director, Management Services Division, Farmer Cooperative Service, USDA. (Office Techniques)
- GARNETT, JOHN R., (1957). B.S., Virginia. Chief, Branch of Employment, Division of Personnel Management, Office of the Secretary, Department of the Interior. Taught at Lycée Carnot (Dijon, France). (Public Administration)
- GAROFALO, JOSEPH T., JR., (1963). M.B.A., U. S. Air Force Institute of Technology. Chief, Manned Spacecraft Preflight Operations, Office of Manned Space Flight (OMSF), Headquarters, National Aeronautics and Space Administration. (Technology)
- GARSON, WARFIELD, (1963). M.D., University of Southern California at Los Angeles. Chief, Career Development Division, Office of Personnel, Office of Surgeon General, Public Health Service, Department of Health, Education, and Welfare. (Biological Sciences)
- GAUTHEY, J. RICHARD, (1963). M.S., California. Project Officer, Preliminary Design Branch, Bureau of Ships, Department of the Navy. (Mathematics and Statistics)
- GEHRING, J. H., (1949). C.E., Rutgers. Manager, Chief of Naval Operations (DNC) Branch, Bureau of Ships, and Office of Naval Research Branch, Bureau of Yards and Docks, Department of the Navy. (Technology)
- GELMAN, ROBERT M., (1960). M.A., Catholic. Administrator. Taught at American, Georgetown, and George Washington. (Social Sciences)
- GEORGE, CATHERINE F., (1956). B.A., Maine. Chief, Operations Staff, Division of Publishing Services, Department of State. (Languages and Literature)
- GERRETSON, FRED W., (1954). Ph.B., Wisconsin. Government Representative for Photo Products Departments, E. I. du Pont de Nemours and Company. (Technology)
- GIESECKE, HANS, (1961). M.E.E., University of Hannover (Germany). Chief, Experimentation Division, Systems Research and Development Service, Federal Aviation Agency (FAA)

- GILL, CHARLES W., (1962). B.S. in E.E., South Carolina. Supervisory Electronics Engineer, Amphibious Electronics Guidance and Control Systems Section, Bureau of Ships, Department of the Navy. (Technology)
- GISVOLD, PAUL A., (1962). Nav.E., Massachusetts Institute of Technology. Bureau of Ships, Department of the Navy. Taught at Minnesota. (Mathematics and Statistics)
- GOODE, EDWIN R., JR., (1959). D.V.M., Auburn. Assistant to Administrator, Farm Research, Agricultural Research Service, USDA. (Biological Sciences)
- GOODYEAR, HUGO V., (1960). B.S., Tampa. Meteorologist (Research), U. S. Weather Bureau, Department of Commerce. Taught at Florida and Tampa. (Physical Sciences)
- GRANAHAN, DAVID M., (1957). Minneapolis School of Art, Traveling Scholarship. Chief, Exhibit Service, Office of Information, USDA. (Languages and Literature)
- GRANT, CHARLES L., (1943). Director of Finance and Budget Officer, Office of the Director, Office of Budget and Finance, USDA. (Public Administration)
- GREEN, FOREST H., (1959). M.S.C.E., Purdue. Design Engineer, Bureau of Public Roads, Department of Commerce. Taught at Purdue. (Technology)
- GREEN, JOSEPH, JR., (1957). M.A., Boston College, Management Development Division, Office of Training Services, National Security Agency. (Social Sciences)
- GREENEISEN, JON F., (1962). M.S., Illinois. Information Specialist, Office of Information, USDA. Taught at Illinois. (Languages and Literature)
- GREGG, JOHN G., (1962). LL.M., Georgetown. Counsel, Defense Communications Agency, Department of Defense. Taught at American. (Public Administration)
- GRESSETT, GEORGE L., (1961). B. A., Eastern Nazarene. Systems Engineer, International Business Machines. (Mathematics and Statistics)
- GROSS, WILLIAM J., (1953). Property Management Officer, Supply and Property Management Division, Office of Plant and Operations, USDA. (Public Administration)
- GUIDRY, NELSON P., (1947). Geographer, Economic Research Service, USDA. (Mathematics and Statistics)
- GUNTHER, V. SAMUEL, (1959). Chief, Procurement and Contract Management Division, Office of Plant and Operations, USDA. (Office Techniques)
- HADY, THOMAS F., (1963). Ph.D., Minnesota. Fiscal and Financial Economist, Farm Production Economics Division, Economic Research Service, USDA. Taught at Minnesota. (Social Sciences)
- HAHN, WALTER A., (1962). M.A., American. Director, Management Analysis, National Aeronautics and Space Administration. (Special Program)
- HALL, DAVID G., (1954). M.S., Kansas State. Chief, Publications Branch, Information Division, Agricultural Research Service, USDA. Taught at Arkansas. (Committee on Information)
- HALL, FOREST J., (1955). B.Litt., Notre Dame. Supervisory Publications Editor, Agricultural Marketing Service, USDA. (Committee on Publications)
- HALL, ROBERT T., (1948). M.S., Oregon. Chief, Editorial Branch, Division of Information and Education, Forest Service, USDA. (Committee on Publications)
- HALSMAN, JULIUS, (1955). Chief, Photography Division, Armed Forces Institute of Pathology. (Technology)
- HAMILTON, LLOYD W., (1961). LL.B., George Washington. Partner, Arthur Young and Company, Washington, D. C. Taught at George Washington. (Public Administration)
- HAMM, JOSEPH F., (1954). B.C.S., Columbus. Head, Lithographic Section, Soil Conservation Service, USDA. (Technology)
- HANSEN, MORRIS H., (1939). M.A., American. Assistant Director, Research and Development, Bureau of the Census, Department of Commerce. Taught at American. (Mathematics and Statistics)
- HARMAN, SUSAN E., (1937). Ph.D., Johns Hopkins. Emeritus Professor of English, University of Maryland. Taught at Nebraska State Teachers College (Peru). (Languages and Literature)
- HARMS, JOHN, (1962). Ed.M., Pittsburgh. Director of Personnel, Naval Research Laboratory, Department of the Navy. Taught at Iowa State. (Physical Sciences)
- HARRISON, FLOYD P., (1961). Ph.D., Maryland. Assistant Professor of Entomology, University of Maryland. (Biological Sciences)
- HARRISON, H., (1961). Ph.D., Catholic. Chief, Electrophysics Division, Directorate of Research, Office of Advanced Research and Technology, National Aeronautics and Space Administration. Taught at Air Corps Technical School, Scott Field (Illinois). (Physical Sciences)
- HART, WILSON R., (1962). S.J.D., Virginia. Director of Labor Relations, Office of Manpower, Defense Supply Agency, Department of Defense. (Public Administration)
- HAUPTMAN, ROBERT, (1954). B.E.E., College of the City of New York. Section Supervisor, Electromagnetic Compatibility Analysis Center, Armour Research Foundation, Annapolis, Maryland. Taught at Rehrg Radio Institute and Capital Radio Engineering Institute. (Technology)
- HEARNE, CANNON C., (1948). M.S., Wisconsin. Director, Foreign Training Division, Foreign Agricultural Service, USDA. (Committee on Correspondence Study and Extension Education and Social Sciences)
- HEIN, CLARENCE J., (1960). Ph.D., Minnesota. Fiscal Economist, Agricultural Finance Branch, Economic Research Service, USDA. Taught at Kansas, Minnesota, and West Virginia. (Public Administration)
- HENDEE, CLARE, (1957). M.A., George Washington, Deputy Chief for Administration, Forest Service, USDA. (Public Administration)
- HENDERSON, JOHN K., (1962). B.A., West Virginia. Systems Analyst, UNIVAC Division, Sperry Rand Corporation. (Mathematics and Statistics)
- HENDRIX, WILLIAM E., (1962). Ph.D., Wisconsin. Agricultural Economist, Economic Development Branch, Development and Trade Analysis Division, Economic Research Service, USDA. Taught at Chicago. (Social Sciences)
- HENSLEY, MARTHA L., (1950). M.S., Kansas State. Home Economist, Agricultural Research Service, USDA. State Extension Specialist, Illinois and Montana. Taught at Montana State. (Technology)
- HERMANSEN, H. V., (1961). Assistant Chief, Evaluation Division, Systems Research and Development Service, Federal Aviation Agency. Taught in U. S. Navy. (FAA)
- HERRELL, HENRY G., (1957). LL.B., National (George Washington). Deputy Administrator, Management, Agricultural Marketing Service, USDA. (Public Administration and Special Program)
- HIBAN, ANN B., (1962). B.A., Duke. Associate Systems Engineer, International Business Machines. (Mathematics and Statistics)
- HICKEY, THOMAS J., (1943). LL.M., Columbus. Comptroller, Bureau of Medicine and Surgery, Department of the Navy. (Office Techniques)
- HICKS, HELEN G., (1961). M.A., Michigan. Taught at California, Hunter, Northern State (Michigan), and Virginia. (Technology)
- HILBERT, G. E., (1950). Ph.D., Yale, Director, Foreign Research and Technical Programs Division, Agricultural Research Service, USDA. (Public Administration)
- HILL, BERTON F., (1959). B.A., Brown. Executive, Secretary, Institute of Laboratory Animal Resources, National Research Council. (Biological Sciences)
- HILSENATH, JOSEPH, (1957). M.A., Montclair State Teachers College. Chief, Equation of State Section, Heat Division, National Bureau of Standards, Department of Commerce. (Physical Sciences)
- HOFFMANN, CLARENCE H., (1955). Ph.D., Minnesota. Assistant Director, Entomology Research Division, Plant Industry Station, USDA. Taught at Minnesota. (Agricultural Research Center Committee and Biological Sciences)
- HOLLAND, FREDRICK C., (1963). M.S. in E.E., Stanford. Senior Systems Engineer, TRW Computers Company. (FAA)
- HOOKS, LANCE, (1956). Public Information Specialist, Marketing Information Division, Agricultural Marketing Service, USDA. (Committee on Information)
- HORD, WARNER H., (1945). M.B.A., Harvard. Chief, Office of Carrier Accounts and Statistics, Civil Aeronautics Board. Taught at Tulane. (Public Administration)
- HOUSEMAN, EARL E., (1951). M.S., South Dakota. Director, Standards and Research Division, Statistical Reporting Service, USDA. Taught at Iowa State. (Mathematics and Statistics)

- HOWARD, JAMES O., (1960). Ph.D., Iowa. Director, Trade Projects Division, Foreign Agricultural Service, USDA. Taught at Duke. (Social Sciences)
- HUBBARD, HENRY F., (1955). Ph.D., George Washington. Personnel Officer, District of Columbia Government. Taught at George Washington. (Public Administration)
- HUBERT, LESTER F., (1955). M.S., Chicago. Meteorologist, U. S. Weather Bureau, Department of Commerce. (Physical Sciences)
- HUDDLESTON, HAROLD F., (1956). M.A., Michigan State. Mathematical Statistician, Statistical Reporting Service, USDA. Taught at Michigan State. (Mathematics and Statistics)
- HURLEY, JOHN J., (1963). M.A., Columbia. Business Economist, Office of Executive Director, Federal Trade Commission. Taught at Gettysburg, Le Moyne, and William and Mary. (Social Sciences)
- HURTT, ALVIN J., (1961). M.S., Illinois. Chief, Training and Development Division, Personnel Service, Department of Medicine and Surgery, Veterans Administration. (Public Administration)
- HUSSONG, WILLIAM J., JR., (1963). Nav.E., Massachusetts Institute of Technology. Industrial Officer, David Taylor Model Basin, U. S. Navy. (Mathematics and Statistics)
- JACKSON, SETH, (1957). B.S., Cornell. Chief, Branch of Safety and Employee Relations, Forest Service, USDA. Chairman, Society of American Foresters' Committee on Safety; Member, American Society of Safety Engineers, Coordinating Committee, Federal Safety Council, and Woods Products Section, National Safety Council. (Correspondence)
- JACOBSON, DOOROTHY H., (1963). M.A., Minnesota. Assistant to the Secretary, USDA. Taught at Macalester. (Public Administration)
- JAFFÉ, ERWIN, (1947). Ph.D., Harvard. Plans and Programs Office, National Flight Data Center, Flight Information Division, Air Traffic Service, Federal Aviation Agency. Taught at Harvard. (Languages and Literature)
- JAMES, EDWARD F., (1963). M.A., Maryland. Knights of Columbus Graduate Fellow, The Catholic University. Taught at Maryland. (Languages and Literature)
- JAQUITH, RICHARD H., (1961). Ph.D., Michigan State. Associate Professor of Chemistry, University of Maryland. Taught at Colby, Connecticut, Massachusetts, and Michigan State. (Physical Sciences)
- JEBENS, ARTHUR B., (1953). J.D., Iowa. Director of Management Research, Office of the Secretary, Department of the Interior. (Public Administration)
- JESSEL, J. J. A., (1942). D.Sc., Harvard. Chief, Division of Electric Resources and Requirements, Bureau of Power, Federal Power Commission. Taught at Harvard. (Technology)
- JEX, GARNET W., (1955). M.F.A., George Washington. Chief, Graphics Section, Bureau of State Services, U. S. Public Health Service, Department of Health, Education, and Welfare. *Retired*. (Technology)
- JOHNSON, SHERMAN E., (1937). Ph.D., Harvard. Deputy Administrator for Foreign Economics, Economic Research Service, USDA. Taught at Minnesota, Montana State, and South Dakota State. (Social Sciences)
- JOHNSON, JUDITH, (1962). B.S., State University of Iowa. Associate Instructor, Education Center, International Business Machines. (Mathematics and Statistics)
- JOHNSON, WALTER N., (1963). Photo Technician, Office of Information, USDA. (Technology)
- JOHNSTON, DENIS F., (1962). Ph.D., American. Labor Economist, Division of Manpower and Employment Statistics, Bureau of Labor Statistics, Department of Labor. Taught at American and Howard. (Social Sciences)
- JONES, ALLEN H., (1957). M.A., Temple. Head, Department of English, Montgomery Junior College. Taught at Girard, Montgomery Junior College, and Muhlenberg. (Languages and Literature)
- JORGENSEN, DONALD L., (1962). M.S., Nebraska. Instructor, Office of Forecast Development, U. S. Weather Bureau, Department of Commerce. Taught at Dodge City (Kansas) Jr. College and Nebraska. (Physical Sciences)
- JOSEPHSON, HORACE R., (1949). Ph.D., California. Director, Division of Forest Economic and Marketing Research, Forest Service, USDA. Taught at California. (Social Sciences)
- KAHN, DONA S., (1960). LL.B., Rutgers. Attorney, General Regulatory Division, Office of the General Counsel, USDA. (Correspondence)
- KAUFHOLZ, FERDINAND, (1949). B.C.E., Johns Hopkins. Director, Program Management Office, Public Buildings Service, General Services Administration. (Technology)
- KAUFMAN, MILTON, (1940). M.S., College of the City of New York. Shipping and Foreign Aid Adviser, Foreign Trade Division, Bureau of the Census, Department of Commerce. (Mathematics and Statistics)
- KAZYAK, LEO, (1963). B.S., Detroit. Toxicologist, Division of Biochemistry, Walter Reed Army Institute of Research, Walter Reed Army Medical Center. (Physical Sciences)
- KEIM, S. D., (1960). B.S., Maryland. Head Engineer, Marine Corps and Amphibious Electronics Branch, Electronics Division, Bureau of Ships, Department of the Navy. (Technology)
- KEISER, HENRY B., (1960). LL.B., Harvard. Attorney and Publisher of *The Government Contractor*. Taught at George Washington. (Public Administration)
- KELLY, WILLIAM B., JR., (1963). Ph.D., Fletcher School of Law and Diplomacy, Tufts. Director, Special Projects Staff, Trade and Commercial Policy Division, Department of Commerce. Taught at Boston, Fletcher School of Law and Diplomacy, and Georgetown. (Social Sciences)
- KIBLER, WILLIAM E., (1963). M.S.A., Georgia. Mathematical Statistician, Standards and Research Division, Statistical Reporting Service, USDA. (Mathematics and Statistics)
- KIEFER, CHARLES F., (1958). M.P.A., Harvard. Director, Office of Management Services, USDA. (Special Program)
- KILPATRICK, FRANKLIN P., (1960). Ph.D., Princeton. Senior Staff Member, The Brookings Institution. Taught at Princeton. (Social Sciences)
- KIMLER, ALEXANDER, (1960). Ph.D., Vanderbilt. Chief, Microbiology Section, Germfree Research, Walter Reed Army Institute of Research. Taught at Miami School of Medicine. (Biological Sciences)
- KIRBY, JOSEPH F., (1961). B.S. in S.Sc. American. Supply and Property Management Office, Supply and Property Management Division, Office of Plant and Operations, USDA. (Public Administration)
- KIRKHAM, MARK M., (1954). Graduate study, University of Chicago. Management Analyst, Office of Management, Department of State. (Office Techniques and Public Administration)
- KLIMAN, ALBERT J., (1962). M.P.A., Harvard. Budget Examiner, Division of Budget Policies and Operations, Office of Budget and Finance, USDA. (Office Techniques)
- KLOCK, BENNY L., (1961). M.S., Cornell. Astronomer, U. S. Naval Observatory, Department of the Navy. Taught at Cornell. (Physical Sciences)
- KNAPP, GEORGE C., (1961). B.A., South Dakota. Program and Budget Analyst, Office of Budget and Finance, USDA. (Public Administration)
- KNIPPLING, EDWARD F., (1954). Ph.D., Iowa State. Director, Entomology Research Division, Agricultural Research Service, USDA. (Biological Sciences and Special Program)
- KOCH, E. JAMES, (1953). M.S., North Carolina State. Biometrician, Agricultural Research Service, USDA. (Biological Sciences)
- KOEBEL, RALPH F., (1943). S.J.D., Georgetown. Assistant General Counsel, Office of the General Counsel, USDA. (Public Administration)
- KOFFSKY, NATHAN M., (1954). M.A., American. Administrator, Economic Research Service, USDA. (Social Sciences)
- KONKLE, WARD W., (1960). B.A., Pittsburgh. Editor, Agricultural Science Review, Cooperative State Experiment Station Service, USDA. Taught at Wooster High School (Ohio). (Languages and Literature and Correspondence)
- KOTEEN, JACK, (1957). B.A., New York. Senior Planning Assistance Officer, Planning Assistance Division, Agency for International Development, Department of State. Taught at American. (Public Administration)
- KOZAK, KATHRYNE B., (1957). Free Lance Writer and Indexer. (Languages and Literature)
- KRAMER, SAMUEL A., (1962). Ph.D., Ohio State. Analyst in Medical and Health-related Fields, Division of Research Grants, National Institutes of Health, Department of Health, Education, and Welfare. Taught at Ohio State. (Social Sciences)

- KRIESBERG, MARTIN, (1952). Ph.D., Harvard. Marketing Specialist, Agricultural Marketing Service, USDA. Adjunct Professor, American University. Taught at Michigan. (Public Administration)
- KRUEGER, LOUISE M., (1946). M.A., George Washington. Staff Accountant, Accounting Division, Office of Management Services, Federal Aviation Agency. Taught at George Washington. (Office Techniques)
- KURI, SALME H., (1963). I.U.D., Freiburg (Germany) M.S. in L.S., Catholic. Supervisory Librarian, Cataloging Section, Library, Bureau of the Census, Department of Commerce. (Languages and Literature)
- LAKEY, KEITH G., (1962). Nav.E., Massachusetts Institute of Technology. Commander, Assistant Branch Head, Electronic Materials Branch, Bureau of Ships, Department of the Navy. (Mathematics and Statistics)
- LANDO, ROBERT H., (1947). M.A., California. Management Analyst, Program Development Division, Office of Records Management, National Archives and Records Service, General Services Administration. (Office Techniques)
- LANE, IRA A., (1954). B.S., New York State College of Forestry. In Charge, Division Training Center, Plant Quarantine Division, Agricultural Research Service, USDA. (Biological Sciences)
- LANEY, ARTHUR R., (1961). Ph.D., George Washington. Assistant to Director of Personnel, Washington Gas Light Company. (Public Administration)
- LAXTON, WILLIAM C., (1946). B.A., George Washington. Director, Personnel Division, Agricultural Marketing Service, USDA. (Public Administration)
- LAZZARI, PIETRO, (1944). Master Artist, Ornamental School of Rome. Belle Arti. Portrait artist, landscape painter, and graphic designer. Fulbright Research in Art Media and Technique. Taught at American and Beaux Arts Institute of Design, New York. (Technology)
- LEAHY, CLIFFORD J., (1961). Director, Eastern Division, Tridea Electronics, Inc. (Committee on Instructional Improvement and Technology)
- LE CLERG, E. L., (1949). Ph.D., Minnesota. Director, Biometrical Services Division, Agricultural Research Service, USDA. (Biological Sciences and Correspondence)
- LEDERER, MARIANNE, (1947). Lehramtspruefung, University of Vienna. Taught at American. (Languages and Literature)
- LEEDY, DANIEL L., (1950). Ph.D., Ohio State. Chief, Division of Outdoor Recreation, Department of the Interior. (Biological Sciences)
- LEFEBVRE, R. J., (1946). B.Ch., New York. Product Manager, Sumner Williams, Inc., Boston, Massachusetts. (Technology)
- LEHMANN, RICHARD P., (1963). Ph.D., North Carolina State. Biometrician, Biometrical Services, Agricultural Research Service, USDA. Taught at North Carolina State and Virginia Polytechnic Institute. (Mathematics and Statistics)
- LEICH, HAROLD H., (1946). M.A., American. Chief, Program Planning Division, Civil Service Commission. (Public Administration)
- LEVENBERG, MARVIN H., (1955). B.S., Georgetown. Chief, Audit Plans and Programs Branch, Federal Aviation Agency. (Public Administration)
- LEVERTON, RUTH M., (1962). Ph.D., Chicago. Assistant Administrator, Office of Administrator, Agricultural Research Service, USDA. Taught at Nebraska and Oklahoma State. (Biological Sciences)
- LEWIS, BRINLEY J., (1963). M.S. in P.A., Syracuse. Chief, Budget Division, Area Redevelopment Administration, Department of Commerce. Taught at Colorado College and Syracuse. (Office Techniques and Operations)
- LEWIS, KEITH B., (1946). B.A., Georgia. Manager, Washington Office, Eastman Kodak Company. (Technology)
- LOBB, JAMES H., (1954). B.S., Fordham. Chief, Division of Accounting, Payroll, and Audit Operations, Department of Labor. (Public Administration)
- LOGAN, CHARLES A., (1947). M.S., Kansas State. Superintendent, Agricultural Research Center Operations, USDA. Taught at Kansas State. (Agricultural Research Center Committee)
- LONG, ERVEN J., (1962). Ph.D., Wisconsin. Director, Agriculture Service, Office of Human Resources and Social Development, Agency for International Development, Department of State. Taught at Bangalore (India), Tennessee, and Wisconsin. (Social Sciences)
- LORING, BLAKE M., (1941). ScD., Massachusetts Institute of Technology. Consulting Metallurgist. Taught at Maryland and Massachusetts Institute of Technology. (Technology)
- LUTTRELL, DOROTHY M., (1947). Program Manager (Records and Paperwork Management), Internal Revenue Service, Department of the Treasury. (Office Techniques)
- LYMAN, JOHN, (1951). Ph.D., California. Associate Program Director for Oceanography, National Science Foundation. (Physical Sciences)
- LYON, ROWLAND, (1946). M.A., George Washington. Curator—Art and Associate Curator—Restoration, National Collection of Fine Arts, Smithsonian Institution. Taught at George Washington. (Technology)
- MAGINN, BRIDGET, (1963). B.S., Liverpool (England) College of Home Economics. Director of Sewing Schools. Taught at West Riding (Yorkshire, England) private sewing schools. (Technology)
- MANDEL, BENJAMIN J., (1961). M.A., George Washington. Director, Office of Statistical Programs, Post Office Department. Taught at Baltimore. (Public Administration)
- MANNING, JOHN G., (1963). M.Ed., Maryland. Training Director, Office of Administration, National Aeronautics and Space Administration. Taught at Air Force School for Personnel Management. (Special Program)
- MANN, JOHN F., JR., (1960). B.S., Pennsylvania State. Marketing Representative, International Business Machines. (Mathematics and Statistics)
- MARGULIES, MAURICE M., (1961). Ph.D., Yale. Biochemist, Division of Radiation and Organisms, Smithsonian Institution. (Biological Sciences)
- MARTIN, DOROTHY M., (1958). B.A., Bates. Public Information Specialist, Forest Service, USDA. Taught at Appleton Academy and Quimby School (New Hampshire). (Committee on Information)
- MARTIN, W. HOWARD, (1956). Corcoran School of Art, Negative Work Supervisor, Cartographic Section, Soil Conservation Service, USDA. (Technology)
- MASON, CHARLES N., SR., (1943). M.A., Montana. Accountant. Taught at George Washington and Montana. (Public Administration)
- MASSIE, E. S., (1961). C.E., South Carolina. Chief, Surveys and Maps Branch, Division of Engineering, Forest Service, USDA. (Technology)
- MATERAZZI, ALBERT R., (1948). D.Ch., Rome. Technical Representative and Research Coordinator, Litho Chemical and Supply Company, Inc. (Technology)
- MATHIER, R. J., (1963). B.S., Oregon State. Head, Transmission and Coordination Section, Bureau of Power, Federal Power Commission. (Technology)
- MATTHEWS, ALBERT W., (1957). Chief, Photographic Services, Office of Information, USDA. (Technology)
- MATTHEWS, EARLE D., (1963). Ph.D., Maryland. Soils Specialist, Maryland State Office, Soil Conservation Service, USDA. Taught at Arkansas and Tampa. (Biological Sciences)
- MATTHEWS, JOSEPH L., (1952). Ph.D., Chicago. Director, Division of Extension Research and Training, Federal Extension Service, USDA. (Social Sciences)
- MATTMAN, ALFRED G., (1962). B.S., Florida State. Data Systems Programmer, Department of Defense. (Mathematics and Statistics)
- MAY, EUGENE F., (1952). Cartographer, Soil Conservation Service, USDA. (Correspondence)
- MCDONALD, TERRY J., (1958). George Washington. Chief, Division of Supply and Transportation Management, Office of Operations, Department of State. (Office Techniques)
- MCCLEAREN, J. KENDALL, (1946). Director, International Trade Fairs Division, Foreign Agricultural Service, USDA. (Languages and Literature)
- MCCORMICK, JAMES H., (1946). M.S., Georgetown. Assistant Director, Office of Information, USDA. (Committee on Publications and Languages and Literature)
- MCCRACKEN, KELLY T., (1961). B.A., George Washington. Chief, Procurement and Supply Management Branch, Division of General Services, Office of Administration, Office of the Secretary, Department of Health, Education, and Welfare. (Office Techniques)

- McCULLOUGH, NORMAN L., (1960). Photographer, Research Analysis Corporation, Department of the Army. (Technology)
- McCURLEY, JAMES B., (1960). D. Eng., Johns Hopkins, Director, Electric Distribution Division, Rural Electrification Administration, USDA. Taught at Yale and U. S. Naval Academy. (Mathematics and Statistics)
- McDANIEL, PAUL W., (1959). Ph.D., Indiana. Director, Division of Research, U. S. Atomic Energy Commission. Taught at Auburn. (Physical Sciences)
- McGANN, LEONARD D., (1962). Deputy Chief, Computer Operations, Data Processing Systems Division, Bureau of the Census, Department of Commerce. (Mathematics and Statistics)
- McGRANE, EDWARD J., (1962). M.S. in E.E., Pennsylvania. Acting Assistant Director, Directorate for Engineering, National Military Command System, Defense Communications Agency, Department of Defense. (Mathematics and Statistics)
- McINTYRE, RALPH G., (1962). LL.B., Columbus. Chief, Supply and Property Management Division, Office of Plant and Operations, USDA. (Public Administration)
- McKENNA, DUANE A., (1952). B.F.A., South Dakota. Staff Artist, *U. S. News & World Report*. (Technology)
- McOMBER, DALE R., (1962). M.A., Bowling Green State. Budget Preparation Specialist, Bureau of the Budget. Taught at Bowling Green State. (Office Techniques)
- MEANLEY, BROOKE, (1962). M.A., Maryland. Wildlife Research Biologist, Patuxent Wildlife Research Center, Bureau of Sport Fisheries and Wildlife, Department of the Interior. (Biological Sciences)
- MEEHAN, ROBERT H., (1962). Head, Office Methods, Navy Management Office, Department of the Navy. (Public Administration)
- MERCREADY, ROBERT B., (1955). M.A., Maryland. Geographer, Defense Intelligence Agency, Department of Defense. Taught at Maryland. (Technology)
- MERRITT, ALBERT R., (1957). Head, Equipment Evaluation Division, Photographic Center, Department of the Navy. (Technology)
- MILEHAM, HARRY P., (1947). M.A., Columbia. Chief of Publications, Office of Information, USDA. (Committee on Publications)
- MILES, WYNDHAM D., (1963). Ph.D., Harvard. Historian, National Institutes of Health, Department of Health, Education, and Welfare. Taught at Pennsylvania State. (Physical Sciences)
- MILESON, DONALD F., (1961). A.E., California Institute of Technology, Electronics Engineer, Bureau of Ships, Department of the Navy. (Technology)
- MILLER, LEON H., (1962). M.S. in I.E., Purdue. Operations Analyst, Research Analysis Corporation. Taught at Purdue. (Mathematics and Statistics)
- MILLER, MARTIN H., (1955). M.A., Western Reserve. Senior National Sales Representative, Savings Bonds Division, Department of the Treasury. Winner of many prizes and trophies for excellence in photography. Associate, Photographic Society of America. (Technology)
- MILLER, NORMA RENO, (1958). M.S., Wisconsin. Independent Public Relations Counselor. Taught at Maryland and Pittsburgh. (Languages and Literature)
- MINNIS, O. L., (1960). M.S., Iowa. Assistant Chief, International Training Division, Agency for International Development, Department of State. Taught at Idaho and Montana State. (Social Sciences)
- MINNIS, ROY B., (1961). Ph.D., State University of Iowa. Specialist, Adult Education, Adult Education Branch, Office of Education, Department of Health, Education, and Welfare. Taught at Chicago, Denver, Iowa, and Wyoming. (Committee on Instructional Improvement)
- MINOR, WILLIAM A., (1946). B.S.A., Georgia. Assistant Administrator for Management, Foreign Agricultural Service, USDA. (Public Administration)
- MORGAN, EMMA, (1958). Cortland Teachers. Chief Housekeeper, D. C. General Hospital. Former Member of National Board of National Executive Housekeepers Association. Guest Lecturer, Lewis Hotel School. (Technology)
- MOHRHARDT, FOSTER E. (1955). M.A., Michigan. Director, National Agricultural Library, USDA. (Languages and Literature)
- MOORE, ARTHUR D., (1963). Ph.D., California. Entomologist, Forest Insect Laboratory, Forest Service, USDA. Taught at California. (Biological Sciences)
- MORTON, JOHN W., (1963). B.A., Dartmouth. Associate Instructor, International Business Machines. (Mathematics and Statistics)
- MOULLETTE, JOHN B., (1963). B.S., Trenton State. Instructor, Technical Writing, Salem County (New Jersey) Technical Institute. (FAA)
- MOURÉ, RUPERT F., (1961). M.A., George Washington. Personnel Officer, Food and Drug Administration, Department of Health, Education, and Welfare. Taught at Arlington County (Virginia) Schools. (Languages and Literature)
- MOUSER, C. M., (1953). M.A., Louisiana State. Chief Clerk, Senate Committee on Agriculture and Forestry. Taught at San Houston State and Northwestern State. (Office Techniques)
- MUTH, GEORGE E., (1960). LL.B., George Washington. President, George F. Muth Company, Inc., Washington, D. C. (Technology)
- MYERS, CHARLES T., JR., (1955). Chief, Photography Division, Office of Information, USDA. (Technology)
- NELSON, LIONEL W., (1957). M.A., Stetson. Director, Public Relations and Speech Department, Montgomery Junior College. (Languages and Literature)
- NELSON, PAUL E., JR., (1963). Ph.D. Iowa State. Head, Market Structure and Practices Group, Market Structure and Costs Branch, Marketing Economics Division, Economic Research Service, USDA. Taught at Denison and Maryland. (Social Sciences)
- NERBOSO, SALVATORE, (1955). Ph.D., Harvard. Assistant Director of Libraries, University of Maryland. Taught at Maryland. (Public Administration)
- NEWMAN, ARTHUR E., (1963). B.S., American. Supervisory Operations Research Analyst, Systems Analysis Section, Data Processing Systems Division, National Bureau of Standards, Department of Commerce. (Mathematics and Statistics)
- NICHOLS, A. J., (1952). D.P.A., Harvard. Assistant Director, Foreign Training Division, Foreign Agricultural Service, USDA. (Public Administration)
- NISSELSON, HAROLD, (1946). B.S., College of the City of New York. Senior Scientist, Operations Research, Incorporated. Taught at American. (Mathematics and Statistics)
- NJENGA, FREDERICK A., (1963). B.A., Howard. Instructor in Swahili. (Languages and Literature)
- NORDENSON, TOR, (1956). B.S., Michigan. Chief, Hydrologic Investigations Section, Hydrologic Services Division, U. S. Weather Bureau, Department of Commerce. (Physical Sciences)
- NORDIN, RUTH, (1959). B.A., George Washington. Head, Publications and Editorial Section, Soil Conservation Service, USDA. Taught at Nebraska Public Schools. (Languages and Literature)
- NORRIS, KARL H., (1960). B.S., Pennsylvania State. Leader (Agricultural Engineer). Instrumentation Research Laboratory, Market Quality Research Division, Agricultural Marketing Service, USDA. (Physical Sciences)
- NUNN, W. R., JR., (1961). B.S. in C.E., Oklahoma. Deputy Director, Aeronautical Division, U. S. Naval Oceanographic Office, Department of the Navy. (Technology)
- O'BRIEN, JAMES C., (1955). LL.B., Columbus. Director of Personnel, Department of Health, Education, and Welfare. (Public Administration)
- OGREN, KENNETH E., (1958). Ph.D., Minnesota. Director, Marketing Economics Division, Economic Research Service, USDA. Taught at Minnesota. (Social Sciences)
- OLSON, KENNETH W., (1952). M.A., Michigan. Director, Foreign Market Information Division, Foreign Agricultural Service, USDA. (Languages and Literature)
- ORNSTEIN, JACOB, (1952). Ph.D., Wisconsin. Author and Teacher. Assistant Managing Editor, *Modern Language Journal* (for Slavic and East European Languages). Formerly Associate, Russian Research Center, Harvard University. Taught at Catawba, Waldorf, and Wisconsin. (Languages and Literature)
- ORSINI, F. M., (1963). B.S., Georgia. Director, Cartographic Division, Soil Conservation Service, USDA. (Technology)

- OSBORN, BEN O., (1961). B.S., Oklahoma State. Conservation Writer, Information Division, Soil Conservation Service, USDA. (Biological Sciences)
- OSBORN, GORDON D., (1963). M.B.A., Harvard. Chief, Management Improvement and Research Branch, Office of Management and Organization, Bureau of the Budget. (Public Administration)
- OSGOOD, FREDERIC C., (1960). B.S., Oregon. Chief, Issuances Management Section, Office of Management Services, Federal Aviation Agency. Taught at Oregon. (Office Techniques)
- OTERO, JOSÉ, (1959). Madrid. Editor, Regional Office, World Health Organization. Taught in Argentina, Spain, and United States. (Languages and Literature)
- PACKARD, ROSS L., (1959). Ph.D., Wisconsin. Agricultural Statistician, Field Operations Division, Statistical Reporting Service, USDA. Taught at American. (Social Sciences)
- PAINE, HOWARD C., (1957). B.A., Nebraska. Chief, Borrowers' Accounting Branch, Controller's Division, Rural Electrification Administration, USDA. (Correspondence)
- PALLANSCH, MICHAEL J., (1955). Ph.D., Minnesota. Head, Concentrated Milk Investigations, Eastern Utilization Research Branch, Agricultural Research Service, USDA. Taught at Georgetown. (Physical Sciences)
- PARKER, CARLYLE V., (1963). B.S. in E.E. and Engr. Phys., Michigan. Head, Security Systems and Aviation Branch, Electronics Division, Naval Research Laboratory, Department of the Navy. Taught at Maryland. (Technology)
- PAYNE, KIRBY B., (1960). M.S., Catholic. Assistant Director, Field and Special Services, National Agricultural Library, USDA. Taught at Drexel Institute of Technology. (Languages and Literature)
- PEDELT, MICHAEL J., (1962). M.S., Case Institute of Technology. Research Scientist. Taught at Case Institute. (Mathematics and Statistics)
- PEDRICK, ROBERT A., (1961). M.A., Johns Hopkins. Physical Oceanographer, Radioisotopic Oceanography Project Head, U. S. Naval Oceanographic Office, Department of the Navy. (Physical Sciences)
- PERLMAN, HERBERT L., (1959). LL.B., Columbia. Assistant to the Judicial Officer, Office of the Secretary, USDA. Taught at College of the City of New York. (Public Administration)
- PERLMUTTER, JEROME H., (1955). M.A., American. Chief, Division of Publishing Services, Department of State. (Committee on Publications and Languages and Literature)
- PERSIL, HERBERT G., (1962). Ph.D., Chicago. Budget Analyst, Division of Budget Policies and Operations, Office of Budget and Finance, USDA. Taught at Loyola (Chicago, Illinois). (Office Techniques)
- PETERSON, E. J., (1948). B.S., Wisconsin. Chief, Training and Safety Branch, Personnel Management Division, Soil Conservation Service, USDA. (Committee on Correspondence Study and Extension Education and Technology)
- PIERSON, ROBERT M., (1963). Ph.D., Duke. Humanities Librarian, University of Maryland. Taught at Maryland and Ohio State. (Languages and Literature)
- PIKE, HOWLAND, (1950). Government Sales, Ansco Division, General Aniline and Film Corporation. (Technology)
- PIRLSON, T. ALFRED, (1960). LL.B., George Washington. Procurement Specialist (Pricing), Office of Procurement Policy, Office, Assistant Secretary of Defense (Installations and Logistics), Department of Defense. Taught at George Washington. (Public Administration)
- PIQUET, HOWARD S., (1939). Ph.D., Princeton. Senior Specialist in International Economics, Legislative Reference Service, Library of Congress. Taught at American, California, New York, Oregon, Princeton, and Washington. (Social Sciences)
- PISTRANG, MARVIN A., (1962). B.S., College of the City of New York. Geologist, U. S. Geological Survey, Department of the Interior. Taught at Northwestern. (Biological Sciences)
- PLAIR, THEODORE B., (1962). M.A., California. Head Woodland Conservationist, Soil Conservation Service, USDA. (Correspondence)
- PLAIT, ALAN O., (1963). B.S. in E.E., Illinois Institute of Technology. Supervisor, Reliability Engineering, Melpar, Inc. Taught at Illinois Institute of Technology. (Technology)
- POLLOCK, ROSS, (1946). M.A., George Washington. Assistant Director, Office of Career Development, Civil Service Commission. Taught at George Washington. (Public Administration)
- POPE, EDWARD V., (1960). M.A., Pennsylvania. Extension Specialist in Child Development and Human Relations, Federal Extension Service, USDA. Taught at Cornell, George Washington, and Temple. (Social Sciences)
- POPE, WILLIAM C., (1960). B.S. in I.E., Northeastern. Registered Professional Engineer, District of Columbia. Chief, Branch of Safety Management, Division of Personnel Management, Office of Administrative Assistant Secretary, Department of the Interior. Taught at South American Universities. (Public Administration)
- POPECKI, JOSEPH T., (1952). B.S. in L.S., Catholic. Assistant Director of Libraries, Catholic University. (Languages and Literature)
- POTTER, WILLIAM D., (1952). M.S., Cornell. Hydraulic Engineer, Hydraulic Research Division, Bureau of Public Roads, Department of Commerce. (Technology)
- PRICE, BRUCE C., (1962). B.S. in E.E., Oregon State. Assistant Regional Administrator, Regional Office, General Services Administration. (Public Administration)
- PRICE, H. WALTER, (1953). B.S., Drexel Institute of Technology. Chief, Reliability Branch, Harry Diamond Laboratory. (Technology)
- PRICHARD, JAMES W., (1961). B.A., Yale. Operations Research Analyst, Advanced Logistics Research Division, Bureau of Supplies and Accounts, Department of the Navy. (Public Administration)
- PRITZKER, DOROTHY P., (1956). B.A., Kentucky. Employee Development Officer, Bureau of the Census, Department of Commerce. (Languages and Literature)
- PRITZKER, LEON, (1959). M.A., Pennsylvania. Chief, Response Research Branch, Statistical Research Division, Bureau of the Census, Department of Commerce. Taught at Case Institute of Technology. (Mathematics and Statistics)
- PURDY, ELBRIDGE C., (1943). Master of Photography. Division of Photography, Office of Information, USDA. *Retired.* (Technology)
- PURVES, C. M., (1926). M.A., Minnesota. Director of Statistics, Foreign Agricultural Service, USDA. Taught at Texas A. and M. (Mathematics and Statistics)
- RAFF, MORTON S., (1961). M.A., American. Mathematical Statistician, Office of Statistical Standards, Bureau of Labor Statistics, Department of Labor. Taught at Johns Hopkins. (Mathematics and Statistics)
- RAMSAY, MAYNARD J., (1956). Ph.D., Cornell. Plant Quarantine Inspector (Training-Entomology), Division Training Center, Plant Quarantine Division, Agricultural Research Service, USDA. Taught at Buffalo, Cornell, and Millard Fillmore. (Biological Sciences)
- RANKIN, WILLIAM J., (1959). Photographer. Soil Conservation Service, USDA. (Technology)
- RAPP, WILLIAM F., (1958). B.A., Loyola (California). Management Analysis Division, National Aeronautics and Space Administration. (Public Administration)
- RASMUSSEN, WAYNE D., (1950). Ph.D., George Washington. Agricultural Historian, Economic Research Service, USDA. (Public Administration and Correspondence)
- RAUCHSCHWALBE, OTTO, (1950). M.S., Maryland. Economist, Foreign Agricultural Service, USDA. (Mathematics and Statistics)
- RAUSCHER, CHARLES B., (1963). Chief, Training Branch, Food and Drug Administration, Department of Health, Education, and Welfare. (Committee on Correspondence Study and Extension Education)
- REED, ROBERT C., (1960). M.A., Bowling Green. Assistant, University of Maryland. Taught at Bowling Green and George Washington. (Languages and Literature and Correspondence)
- REEVES, GEORGE T., JR., (1963). M.A., Indiana. Director, Training Division, Internal Revenue Service. Department of the Treasury. (Committee on Correspondence Study and Extension Education)
- REICH, DAVID, (1946). LL.B., Fordham. Attorney at Law. (Public Administration)

- REID, MAX P., (1957). B.S., Utah State Agricultural College. Deputy Director, Office of Personnel, USDA. (Office Techniques and Public Administration)
- REINGOLD, NATHAN, (1963). Ph.D., Pennsylvania. Senior Research Specialist, Science and Technology Division, Library of Congress. Taught at Yale. (Physical Sciences)
- REYNOLDS, JAMES E., (1961). B.A., George Washington. Chief, Marketing Research Branch, Marketing Information Division, Agricultural Marketing Service. (Languages and Literature)
- REZNIKOFF, DAVID, (1959). College of the City of New York. Planner, Government Printing Office. Taught at Howard. (Technology)
- RICE, WILLIAM B., (1952). Director of Administration, Office of Emergency Planning, Executive Office of the President. (Public Administration)
- RICHMAN, ERNEST, (1960). M.S., Columbia. Plant Quarantine Inspector (Training), Division Training Center, Plant Quarantine Division, Agricultural Research Service, USDA. (Biological Sciences)
- RIXSE, JOHN H., JR., (1958). B.S. in E.E., George Washington. Registered Professional Engineer. Chief, Power System Engineering Branch, Rural Electrification Administration, USDA. Taught at Virginia.
- ROBERTSON, ROB R., (1962). M.A., Columbia. Taught at Chattanooga and Mercer. (Special Program)
- ROBESON, EVELYN J., (1955). B.S. in B.A., New Mexico State. Records Management Officer, Branch of Property and Supply, Bureau of Indian Affairs, Department of the Interior. Taught at High Schools in New Mexico and Texas. (Office Techniques)
- ROBIN, EDWARD A., (1962). M.S. in E.E., New York. Technical Staff, TRW Computers Company, Canoga Park, California. Taught at Miami. (FAA)
- ROBINSON, JAMES L., (1953). M.S., Cornell. Extension Economist, Agricultural Economics Programs, Federal Extension Service, USDA. *Retired.* (Committee on Correspondence Study and Extension Education)
- ROBBELL, OSCAR, (1956). Chief, Color Photographic Branch, Armed Forces Institute of Pathology, Walter Reed Army Medical Center. (Technology)
- ROGERS, JOSEPH B., (1960). M.S., Washington State. Personnel Management Specialist, Personnel Division, Soil Conservation Service, USDA. (Correspondence)
- ROYKO, ANTHONY S., (1959). M.S., Connecticut. Economic and Statistical Analysis Division, Economic Research Service, USDA. Taught at Connecticut. (Mathematics and Statistics)
- ROSENBLATT, HARRY M., (1962). Ph.D., George Washington. Mathematical Statistician, Statistical Research Division, Bureau of the Census, Department of Commerce. Taught at American. (Mathematics and Statistics)
- ROSENZWEIG, BENJAMIN, (1951). B.S. in Ch.E., College of the City of New York. General Engineer, Defense Supply Agency, Department of Defense. (Technology)
- ROWE, HAROLD B., (1947). B.S., Iowa State. Member, Senior Staff, The Brookings Institution. *Retired.* Taught at Massachusetts and Minnesota. (Social Sciences)
- ROWE, WILLIAM H., (1934). M.S., Kansas State. Federal Crop Insurance Corporation, USDA. Taught at Akron and Kansas State. (Public Administration)
- RUPPERT, M. CLARE, (1947). M.A., George Washington. Coordinator, Adult Services, D. C. Public Library. (Committee on Instructional Improvement and Languages and Literature)
- RUSSELL, CARL M., (1961). M.S. in E.E., Maryland. Assistant Chief, Research Division, Systems Research and Development Service, Federal Aviation Agency. Taught at Maryland. (FAA)
- RYAN, WALTER F., (1953). Ph.D., Cornell. Deputy Chief, Office of Statistical Standards, Bureau of the Budget. (Mathematics and Statistics)
- SAATY, THOMAS L., (1954). Ph.D., Yale. Head, Mathematics Branch, Office of Naval Research, Department of the Navy. Taught at American, Catholic, and George Washington. (Mathematics and Statistics)
- SAPP, CARL R., (1962). M.A., American. Chief, Division of Legislative Reporting, Office of Budget and Finance, USDA. (Public Administration)
- SAWCHUCK, HENRY A., (1949). M.S., College of the City of New York. Chief, Traffic Services Section, Office of Engineering, Bureau of Public Roads, Department of Commerce. (Technology)
- SCALA, THEODOSIE, (1961). M.A., Theological Academy, Bessarabia (Rumania). Instructor in Russian. Taught at Department of Education, Boston (Massachusetts) and Omaha. (Languages and Literature)
- SCHAAL, WILBERT, (1956). B.S., Ohio State. Agricultural Trade Promotion Specialist, Foreign Agricultural Service, USDA. (Correspondence)
- SCHAEZNER, J. P., (1949). B.S., Wisconsin. Agricultural Engineer, Electric Distribution Division, Rural Electrification Administration, USDA. Taught at Wisconsin. *Retired.* (Technology)
- SCHNEIDER, SIDNEY, (1955). B.A., Brooklyn. Supervisory Budget Administration Officer, General Services Administration. Lectured at George Washington. (Public Administration)
- SCHRIMPER, RICHARD J., (1961). M.S., Iowa State. Analytical Statistician, Agricultural Price Statistics Branch, Statistical Reporting Service, USDA. (Mathematics and Statistics)
- SCHULE, JOHN J., JR., (1954). B.A., St. John's (New York). Division Director, Oceanographic Prediction Division, U. S. Naval Oceanographic Office, Department of the Navy. Taught at New York. (Physical Sciences)
- SCHULKIN, MORRIS, (1960). M.S., George Washington. Chief Scientist, Marine Electronics Office, AVCO Corporation. Taught at Drexel Institute of Technology and George Washington. (Physical Sciences)
- SCHULMAN, FRED, (1957). Ph.D., Georgetown. Chief, Nuclear Electric Power Systems. National Aeronautics and Space Administration. Taught at Pearl Harbor Training School and Virginia Polytechnic. (Technology)
- SCHULTHEIS, HENRY, (1955). B.S., in Lands. Arch., Cornell. Construction Management Engineer, Office of Chief of Engineers, Department of the Army. (Technology)
- SCHWARTZ, M. H., (1959). B.A., Illinois. Director, Division of Data Processing, Federal Reserve Board. (Mathematics and Statistics)
- SCHWARTZ, MILTON A., (1962). B.S., College of the City of New York. Director, Statistics and Economics Division, Bureau of Finance, Post Office Department. Taught at George Washington. (Mathematics and Statistics)
- SCOTT, JOHN W., (1957). B.S., Texas A. and M. Assistant Administrator-Operations, Rural Electrification Administration, USDA. (Correspondence)
- SECREST, ELIZABETH D., (1962). B.A., Colorado College. Management Analyst, Internal Revenue Service, Department of the Treasury. (Correspondence)
- SELBY, ROGER L., (1963). B.A., Maryland. Art Historian. Taught at Claremont and National Gallery of Art. (Technology)
- SELLERS, ASHLEY, (1941). S.J.D., Harvard. Attorney at Law. Taught at Emory and Georgia. (Public Administration)
- SHAPIRO, HARVEY, (1962). Ph.D., Wisconsin. Fiscal and Financial Economist, Economic Research Service, USDA. Taught at Iowa State and Wisconsin. (Social Sciences)
- SHEPPARD, ALAN J., (1960). Ph.D., Illinois. Biochemist, Nutrition Division, Food and Drug Administration, Department of Health, Education, and Welfare. Taught at California. (Physical Sciences)
- SHERROD, JOHN, (1958). M.S., Pennsylvania State. Chief, Information Services and Systems Branch, U. S. Atomic Energy Commission. Taught at Pennsylvania State. (Languages and Literature and Physical Sciences)
- SHETLER, STANWYN G., (1963). M.S., Cornell. Assistant Curator of Phanerogams, Division of Phanerogams, Department of Botany, Smithsonian Institution. Taught at Cornell and Michigan. (Biological Sciences)
- SHIRAKAWA, HAROLD S., (1963). Ph.D., Notre Dame. Plant Quarantine Inspector (Training Officer-Phytopathology), Division Training Center, Plant Quarantine Division, Agricultural Research Service, USDA. Yale-Bishop Museum Fellow. Taught at Hawaii and Notre Dame. (Biological Sciences)
- SHORTRIDGE, JOHN, (1963). M. M., Indiana. Harpsichord Maker and formerly Associate Curator of Cultural History, Smithsonian Institution. Taught at Chama (New Mexico) Schools. (Technology)

- SHOUB, EARLE P., (1963). B.S., Polytechnic Institute of Brooklyn. Executive Assistant to Assistant Director—Programs, U. S. Bureau of Mines, Department of the Interior. Taught at Pittsburgh. (Public Administration)
- SINGEL, JACOB S., (1949). M.A., Pennsylvania. Chief, Population Estimates and Projections Branch, Population Division, Bureau of the Census. Department of Commerce. Taught at Chile (Santiago). (Mathematics and Statistics)
- SILVERSTEIN, ARTHUR M., (1959). Ph.D., Rensselaer. Immunobiology Branch, Armed Forces Institute of Pathology. (Biological Sciences)
- SIMMONS, WALT R., (1957). M.A., Kansas. Statistical Advisor, U. S. National Health Survey, Department of Health, Education, and Welfare. Taught at American and Kansas. (Mathematics and Statistics)
- SIMMS, D. HARPER, (1952). B.A., B.J., Missouri. Director, Information Division, Soil Conservation Service, USDA. (Committee on Publications)
- SIMONSON, ROY W., (1959). Ph.D., Wisconsin. Director, Soil Classification and Correlation, Soil Conservation Service, USDA. Taught at Iowa State. (Physical Sciences)
- SINAUER, ERNST M., (1961). B.A., Cornell. (Special Program)
- SINGLETON, CAREY B., JR., (1961). M.A., American and Maryland. Agricultural Economist, International Regional Analysis Division, Economic Research Service, USDA. Taught at Southeastern and Virginia. (Social Sciences)
- SNITZER, JAMES R., (1961). Ph.D., Columbia. Private Consultant in Transportation. Taught at George Washington and Oregon State. (Social Sciences)
- SNYDER, F. P., (1932). B.C.E., Ohio State. Hydraulic Engineer. Corps of Engineers, Department of the Army. (Technology)
- SODERSTROM, THOMAS R., (1962). Ph.D., Yale. Associate Curator, Department of Botany, Smithsonian Institution. Taught at Yale. (Biological Sciences)
- SOKOL, SIDNEY S., (1963). M.B.A., College of the City of New York. C.F.A. Assistant Commissioner of Accounts, Bureau of Accounts, Department of the Treasury. (Public Administration)
- SOMMERVILLE, MARIE-THERÈSE J., (1961). LL.B., Paris. Head, French Department, Language Institute-East Branch, Department of Defense. Taught at George Washington and Pomona. (Languages and Literature)
- SOUTHARD, RUPERT B., JR., (1957). B.C.E., Syracuse. Civil Engineer, Chief, Office of International Activities, Topographic Division, U. S. Geological Survey, Department of the Interior. (Technology)
- SOUTHERN, JOHN H., (1962). M.S., Texas A. and M. Chief, Area Economic Development Branch, Resource Development Economics Division, Economic Research Service, USDA. Taught at Texas A. and M. (Social Sciences)
- SFENCER, FRANK H., (1949). Deputy Administrator, Administrative Management, Agricultural Research Service, USDA. (Public Administration)
- SPRINGER, DONALD P., (1957). B.S., Maryland. U. S. Naval Postgraduate School. Technical Planning Analyst, U. S. Weather Bureau, Department of Commerce. (Physical Sciences)
- SPRINGER, PAUL, (1962). Ph.D., Cornell. Chief, Section of Wetland Ecology, Patuxent Wildlife Research Center, Bureau of Sport Fisheries and Wildlife, Department of the Interior. (Biological Sciences)
- STAMMEYER, EUGENE, (1958). Ph.D., Catholic. Staff Psychologist, Psychology Branch, St. Elizabeths Hospital, Department of Health, Education, and Welfare. Taught at George Washington and Loras. (Social Sciences)
- STARKEY, JAMES H., (1950). B.S., Virginia Polytechnic. Assistant Administrator, Office of Administrator, Agricultural Research Service, USDA. Committee on Correspondence Study and Extension Education)
- STARN, HENRY C., (1957). B.A., George Washington. Director, Personnel Management Division, Rural Electrification Administration, USDA. (Office Techniques and Correspondence)
- STATTON, C. D., (1963). B.S. in M.E., Iowa State. Project Engineer, Bechtel Corporation. (Technology)
- STAUBER, B. RALPH, (1931). M.A., Minnesota. Chief, Agricultural Price Statistics Branch, Statistical Reporting, USDA. Taught at Minnesota. (Mathematics and Statistics)
- STEARNS, JOSEPH L., (1957). M.S., College of the City of New York. Mathematician, U. S. Coast and Geodetic Survey, Department of Commerce. Taught at Virginia. (Mathematics and Statistics)
- STEELE, J. GORDON, (1942). Ph.D., Ohio State. Chief, Soil Survey Reports, Soil Conservation Service, USDA. (Correspondence)
- STEFFERUD, ALFRED D., (1960). B.A., St. Olaf. Publications Officer, Office of Information, USDA. Taught at South Dakota Public Schools. (Languages and Literature)
- STEINBERG, JOSEPH, (1942). B.S., College of the City of New York. Chief, Statistical Methods Division, Bureau of the Census, Department of Commerce. (Mathematics and Statistics)
- STEININGER, MARGARET A., (1958). Ray-Vogue School of Interior Decoration. Owner, Peggy's Showroom, Washington, D. C. (Technology)
- STEPHENS, EDMUND, (1952). M.S., Oregon State. Director, Budget and Finance Division, Agricultural Research Service, USDA. (Office Techniques)
- STERLING, MANUEL M., (1961). Doctor in Law and Social Sciences, Havana. Professor of Spanish. (Languages and Literature)
- STEVENS, HENRY, (1946). Ph.D., George Washington. Chief Biochemist, Allergens Laboratory, Eastern Utilization Research and Development Division, Agricultural Research Service, USDA. (Physical Sciences)
- STOCKARD, JAMES G., (1956). M.A., American. Chief, Public Administration Branch, International Training Division, Agency for International Development, Department of State. (Public Administration)
- STOCKER, FREDERICK D., (1955). Ph.D., Cornell. Head, Farm Taxation and Rural Government Section, Farm Production Economics Division, Economic Research Service, USDA. Taught at Cornell and Lehigh. (Social Sciences)
- STOCKMENT, ROBERT L., (1961). Chief, Employee Development and Safety Branch, Personnel Division, Agricultural Research Service, USDA. (Committee on Instructional Improvement)
- STONE, HAROLD A., (1946). M.S.P.A., Syracuse; M.E., Ohio State. Chief, Management Engineering Division, Office of the Comptroller of the Army, Department of the Army. (Public Administration)
- STOVER, JAMES H., (1957). Director, Office of Management and Organization, Office of Administrative Assistant Secretary, Department of the Treasury. (Public Administration)
- SUTER, GLENN W., (1957). M.S., Virginia Polytechnic Institute. Head, Systems Analysis Section, Standards and Research Division, Statistical Reporting Service, USDA. Taught at Bridgewater and Shenandoah. (Mathematics and Statistics)
- SWIFT, CLIFTON E., (1954). B.S., Maryland. Research Chemist, Agricultural Research Service, USDA. (Agricultural Research Center Committee)
- SYKES, JOSEPH F., (1950). Ph.D., Toronto. Chief, Dairy Cattle Research Branch, Animal Husbandry Research Division, Agricultural Research Service, USDA. Taught at Michigan State. (Agricultural Research Center Committee)
- TAEUBER, CONRAD F., (1953). Ph.D., Minnesota. Assistant Director, Bureau of the Census, Department of Commerce. Taught at Mount Holyoke. (Mathematics and Statistics and Social Sciences)
- TATE, ELIZABETH L., (1960). Ph.D., Chicago. Head, Preliminary Cataloging Section, Descriptive Cataloging Division, Library of Congress. (Languages and Literature)
- TAYLOR, HAL R., (1960). M.A., Michigan State. Public Information Officer, Office of Information, USDA. (Languages and Literature)
- TAYLOR, JOHN A., (1961). B.B.A., Massachusetts. Systems Engineer, Federal Systems Division, International Business Machines. (Mathematics and Statistics)
- TAYLOR, WILLIAM WILSON, (1961). South Carolina and Parsons School of Design. Artist. Taught at Ennis School of Painting, Eastport (Maine), Abbott Art School, and Columbia Technical Institute. (Technology)
- TERRY, NEWELL B., (1959). M.A., Kansas. Director of Personnel, Department of the Interior. Taught at Kansas Public Schools. (Public Administration)

- TEWINKEL, G. C., (1946). M.C.E., Syracuse. General Engineer, Office of Research and Development, U. S. Coast and Geodetic Survey, Department of Commerce. Taught at George Washington and Maryland. (Technology)
- THACKREY, FRANKLIN, (1950). M.S., Kansas State. Director, Marketing Information Division, Agricultural Marketing Service, USDA. (Languages and Literature)
- THOM, HERBERT C. S., (1942). M.S., George Washington. Chief Climatologist, Office of Climatology, U. S. Weather Bureau, Department of Commerce. Taught at Cornell, Iowa State, and Maryland. (Physical Sciences)
- THOMAS, ALMON D., (1950). B.S.E.E., Colorado. Hydraulic Engineer, Bureau of Power, Federal Power Commission. (Technology)
- THOMAS, PAUL D., (1948). M.A., Oklahoma. Mathematician, Office of Research and Development, U. S. Coast and Geodetic Survey, Department of Commerce, Taught at Florida, George Washington, Oklahoma, Southeastern State (Oklahoma), and Virginia. (Technology)
- THOMPSON, MURRAY, (1962). Ph.D., California. Director, Policy and Program Appraisal, Agricultural Stabilization and Conservation Service, USDA. Taught at California, Lehigh, Purdue, and Rice. (Social Sciences)
- THURSTON, JOHN H., (1943). Ph.D., Harvard. Staff Assistant, Office of the Deputy Administrator, State and County Operations, Agricultural Stabilization and Conservation Service, USDA. Taught at Northwestern. (Public Administration)
- TIERNY, LOUIS M., (1960). M.E.A., George Washington. Engineer, The Wilberding Company, Inc., Washington, D. C. (Technology)
- TILLER, CARL W., (1946). M.A., Minnesota. Chief of Budget Methods, Office of Budget Review, Bureau of the Budget. (Public Administration)
- TITUS, JAMES W., (1963). M.S., Maryland. Consultant, Mechanical Engineering, Radar Division, Naval Research Laboratory, Department of the Navy. (Technology)
- TOLSON, WILEY W., (1962). Ph.D., Georgetown. Chief Biochemist, Department of Neuroendocrinology, Walter Reed Army Institute of Research, Walter Reed Army Medical Center. Taught at Butler Jr. College (Texas). (Physical Sciences)
- TRACEY, JOSHUA I., JR., (1960). Ph.D., Yale. Geologist, Regional Geology, U. S. Geological Survey, Department of the Interior. (Physical Sciences)
- TRAVIS, ROBERT V., (1962). Ph.D., Maryland. Chairman, Science Department, Gwynn Park High School, Brandywine, Maryland. (Biological Sciences)
- TRELOGAN, HARRY C., (1948). Ph.D., Minnesota. Administrator, Statistical Reporting Service, USDA. Taught at Minnesota. (Special Program and Social Sciences)
- TROTT, L. JOHN, JR., (1962). M.S., North Carolina. Teacher, Burgundy Farms Country Day School. Taught at George Washington. (Biological Sciences)
- TROTTNOW, MARCELLA E., (1962). B.A., State College of Iowa. Teacher, Montgomery Blair High School (Maryland). (Office Techniques)
- TSAO, LIONEL, (1961). M.A., Harvard. Fellow Royal Asiatic Society. Taught at Harvard. (Languages and Literature)
- ULREY, IVON W., (1962). Ph.D., Ohio State. Head, Transportation Economic Research, Economic Research Service, USDA. Taught at Ohio State. (Social Sciences)
- VALLIERES, VINCENT B., (1957). Office of Executive Vice President, Southern Railway System. Instructor, Department of the Army. (Office Techniques)
- VAN DER SALL, WILLIAM R., (1957). Ph.D., Pittsburgh. Assistant Administrator for Management, Soil Conservation Service, USDA. Taught at Pittsburgh. (Office Techniques and Correspondence)
- VAUGHAN, JOHN W., (1957). C.P.A. Deputy Director, Fiscal Division, Agricultural Stabilization and Conservation Service, and Chief Accountant, Commodity Credit Corporation, USDA. (Committee on Internal Audit)
- VICAN, GEORGE, (1958). Docteur de l'Université de Paris (Sorbonne), Diplômé de l'Institut des Hautes Etudes Internationales de l'Université de Paris. Assistant Professor of Modern Languages, Georgetown University. Taught at George Washington, and Universidad Nacional Autónoma de Mexico. (Languages and Literature)
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- VON LUTTICHAU, CHARLES V. P., (1957). M.A., American. Historian, Office of the Chief of Military History, Department of the Army. Taught at Foreign Service Institute. (Language and Literature)
- WADLEY, F. M., (1939). Ph.D., Minnesota. Analytical Statistician in Biology, U. S. Army Chemical Corps, Department of the Army. Taught at Minnesota. (Correspondence)
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- WALKER, NORA M., (1956). Staff Associate, Center for Applied Linguistics. Taught at Foreign Service Institute. (Office Techniques)
- WALLING, HERSCHEL C., (1946). M.B.A., Texas. C.P.A. Supervisory Accountant, General Accounting Office. Taught at Texas. (Public Administration)
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- WHITE, BENNETT S., JR., (1938). Ph.D., Harvard. Acting Director, Economics and Rural Life Division, Cooperative State Experiment Station Service, USDA. Taught at George Washington, Kentucky, and Virginia. (Social Sciences)
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